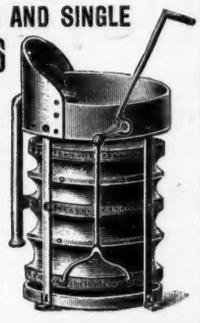
THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXIV. No. 1888.] LONDON, JULY 18, 1899. [51ST YEAR. PRICE 6d.

ABSALOM HARROP
(Maker to the Admiralty),
FITZROY BELLOWS WORKS,
SHEFFIELD.

MANUFACTURER OF THE PATENT
CIRCULAR DOUBLE AND SINGLE BLAST BELLOWS



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Yield of Gas per Ton . . 10,500 Cubic Feet.
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HEATHCOTE GAS COAL.
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Prices and Analysis of all the Scotch Cannels on Application.

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TUBES
And Fittings and Accessories.
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BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c., AND OF
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SEVERAL DESIGNS SHOWN BELOW.

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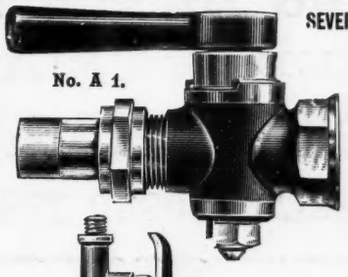

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AS SHOWN.
SUPERIOR QUALITY AND FINISH IN GUN METAL.

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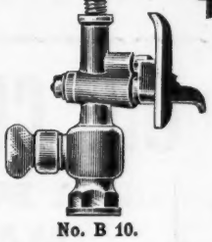

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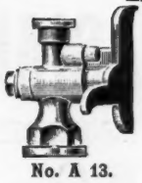

No. A 13.

No. A 12.

No. A 1.

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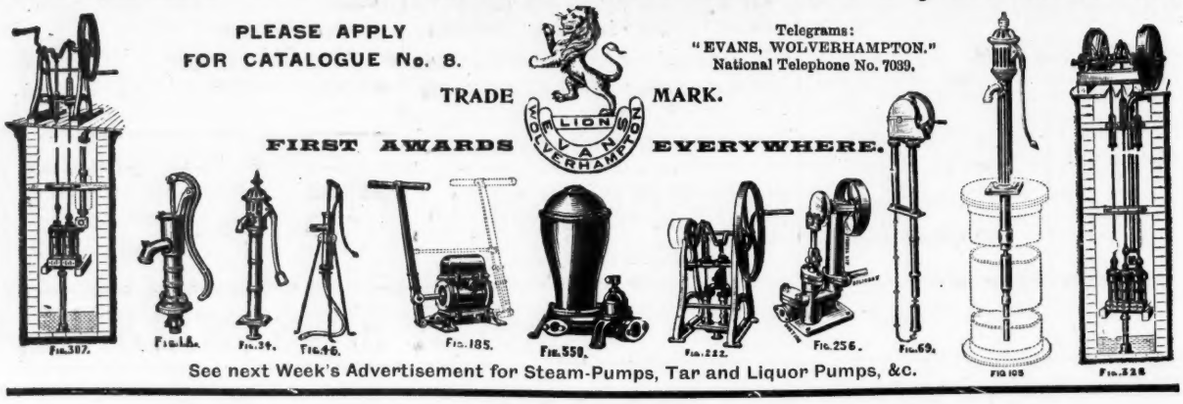

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HOMOGENEOUS IN CHARACTER.

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CAN BE STORED SAFELY ANYWHERE.

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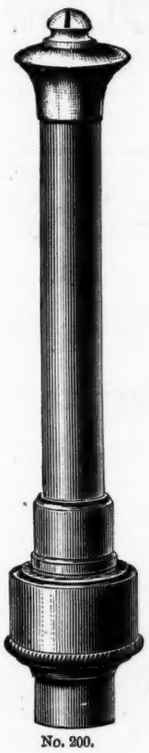

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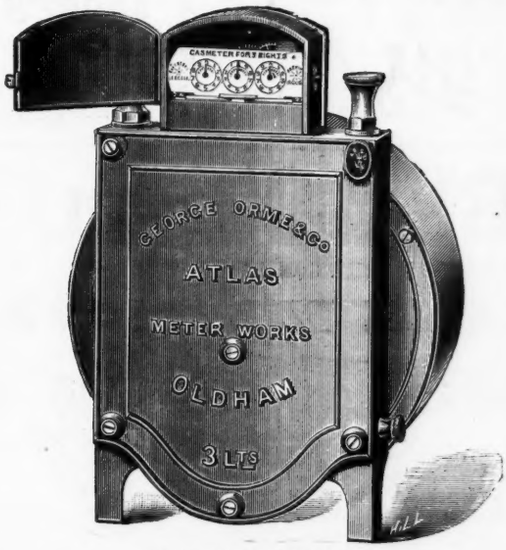

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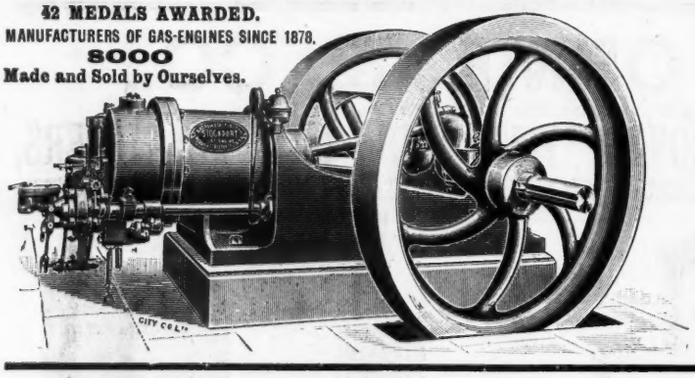

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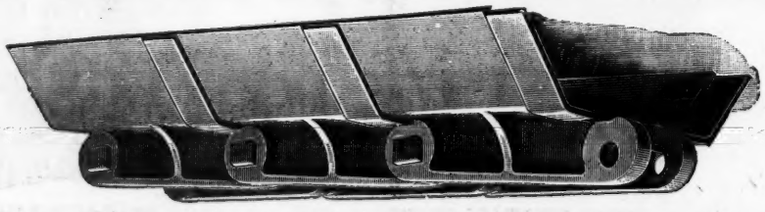

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NEW WELSBACH BURNERS.

25 Candles per Cubic Foot of Gas.

For STREET LIGHTING there is nothing to excel the New Welsbach Burner as shown at Niagara Hall, London, and in the principal Provincial Towns.

The New Welsbach Burner is supplied in SIX Sizes, consuming from ¾ to 7 Cubic Feet of Gas per Hour.

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100 CANDLE POWER WITH 4 CUBIC FEET OF GAS.

To obtain a light of 100 Candles for 4000 hours with Gas at 2s. 3d. per 1000 Cubic Feet would cost—

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Enables the New Welsbach Burner to be used for Street Lighting or otherwise, notwithstanding the severest vibration.

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Does not obstruct the Light.

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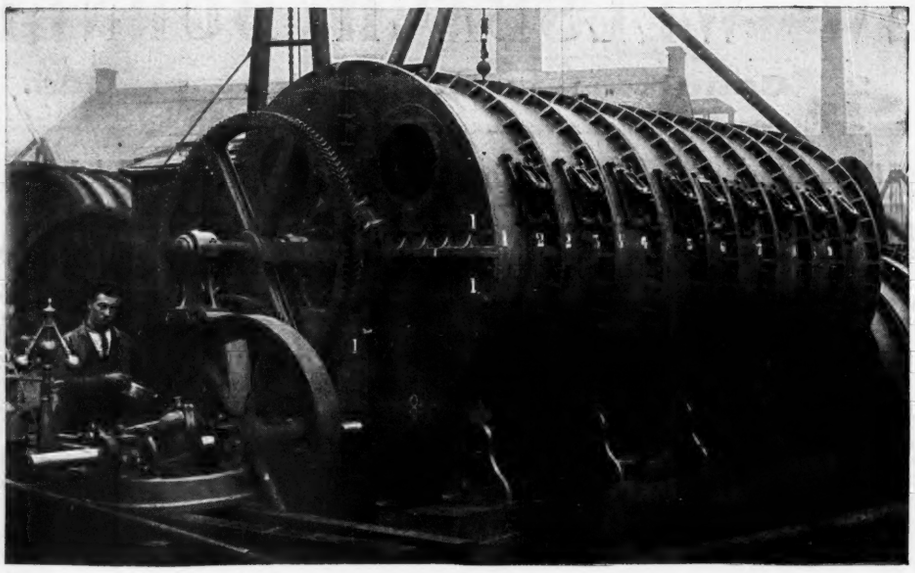

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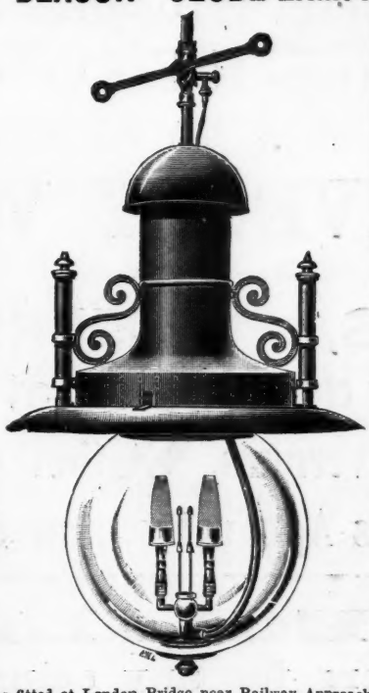

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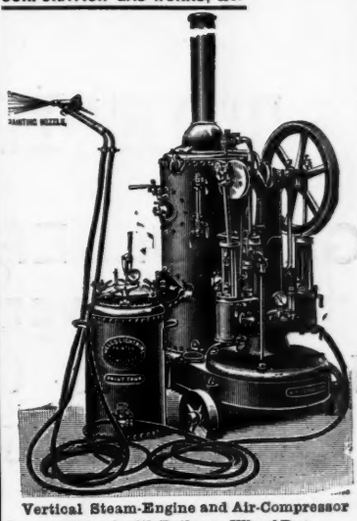

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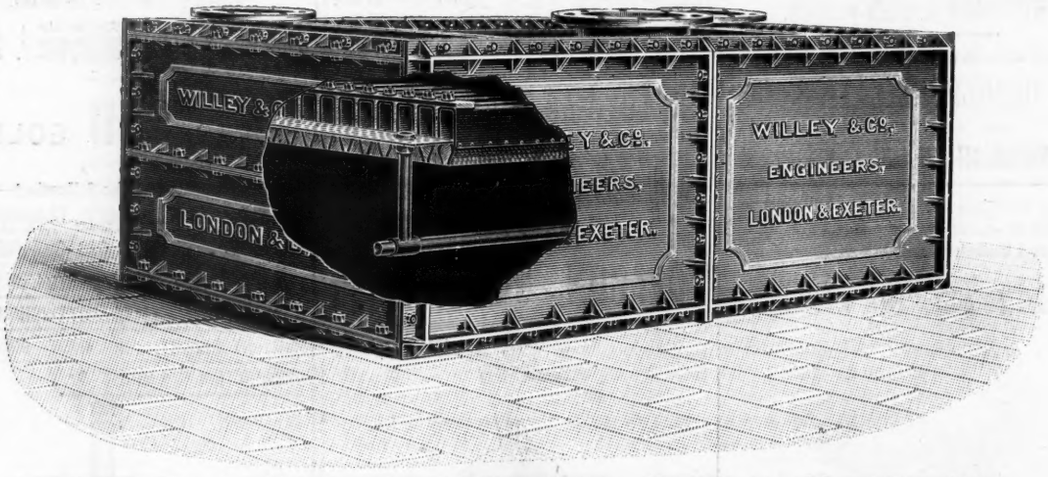

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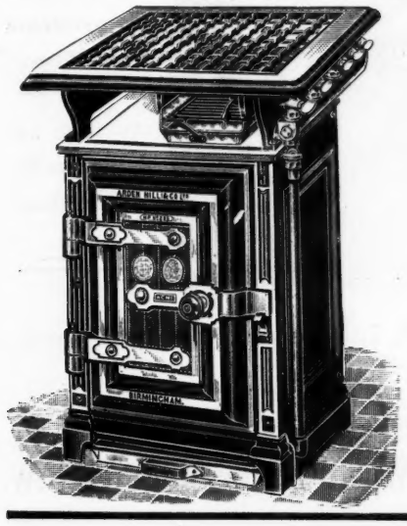

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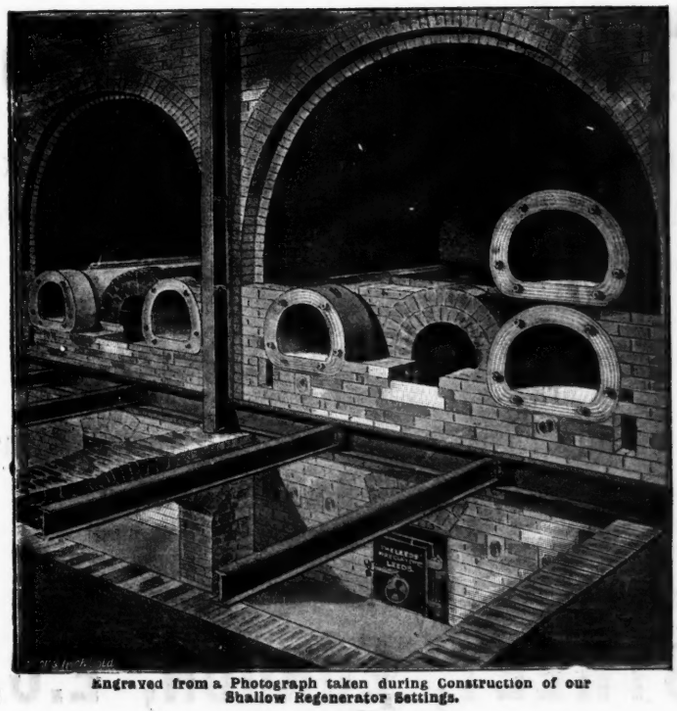

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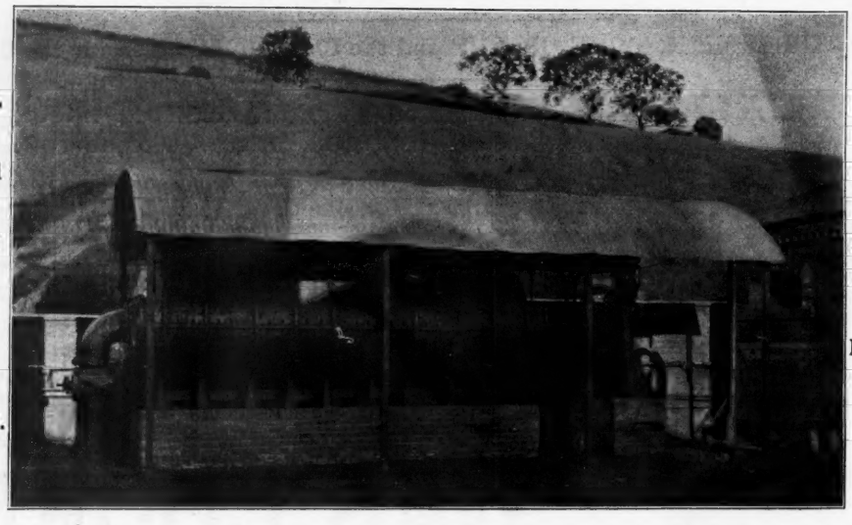

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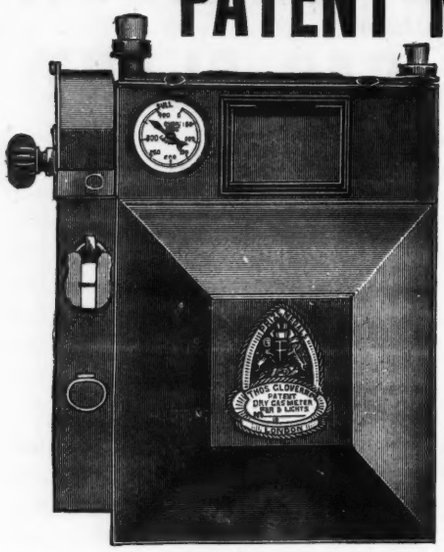

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CONTENTS.

EDITORIAL NOTES:—
GAS, LIGHTING, &c.— PAGE.
Mr. G. Beilby on the Industrial and Domestic Uses of Fuel . . 161
The Passing of the London Government Bill 162
The Honley Gasholder Accident 162
Differential Charges for Gas and Electricity 162
Names for Proprietary Articles 163
WATER AND SANITARY AFFAIRS—
The Hot Weather and the London Water Supply 168
Check to Garden Watering in Birmingham 168
THE PRIZE ESSAY ON SULPHATE OF AMMONIA:—
The Utility of Sulphate of Ammonia in Agriculture. By James Muir, M.R.A.C. 163
ESSAYS, COMMENTARIES, AND REVIEWS:—
Gas and Water Companies in the Stock Market 169
Electric Lighting Memoranda. 169
Six Months' Experience with the Kern Burner for Street Lighting 170
Children as Wage-Earners 171
The Naphthalene Question. 171
Donkin on Smoke Prevention 172
Recent Books on Water Supply 173
TECHNICAL RECORD:—
Society of Chemical Industry—Annual Meeting in Newcastle . . 175
The Use of Coke-Ovens for the Manufacture of Illuminating Gas . 176
REGISTER OF PATENTS:—
Prepayment Gas-Meters—Thompson, H. G., and Mower, S. E. . 177
Incandescence Bodies for Gas-Burners—Duncan, J. H. H. . . . 177
Self-Igniting Incandescent Mantles—Buhlemann, G. 178
Gas-Lamps—Talbot, H. 178
Gas-Igniter—Vietinghoff-Scheel, K. von 178
Regenerative Gas-Lamps—Thomas, T. C. J., and Still, W. M. . . 178
Lighting and Extinguishing Gas—Savelsberg, C. 178
Lighting Gas Taps from a Distance—Schlinemann, G., and Rieder, O. 178
Automatic Gas-Lighter—Birkbeck, H. (Peerless Gas-Lighter Co.) 178
Regulating the Gas Supply to Burners—Jones, J. & D. 178
Gas-Burners—Boulot, C. 179
Automatically Cutting Off and Opening the Supply of Gas to Lamps and Burners—Frenz, W., and Sieverts, W. H. A. . . . 179
Patent Notices 179
CORRESPONDENCE:—
Experience with the Hydraulic Main—Labour Troubles in Denmark—Corrugated Retorts 180
PARLIAMENTARY INTELLIGENCE:—
Gleanings from the Committee-Rooms 180
Progress of Bills 181
House of Commons Committee—Lea Bridge Gas Bill 181
LEGAL INTELLIGENCE:—
High Court of Justice—Queen's Bench Division—Crays Gas Company *v.* Bromley Gas Company—A Question of Boundary . . 182
The Assessment of the Leominster Gas-Works 183
In re the Ottoman Gas Company, Limited 183
Winding Up of the Loanda Gas Company 183
MISCELLANEOUS:—
This Year's Examinations in Gas Manufacture—The Pass List . 183
Metropolis Gas Supply—Chief Gas Examiner's Quarterly Report 183
The Explosion at the Honley Gas-Works—Coroner's Investigation 183
Meeting of the Rushden and Higham Ferrers Gas Company . . 184
Meeting of the New Sunlight Incandescent Company, Limited . 184
The Cheapest Gas in the World—Widnes Breaks Its own Record. 185
Southport Corporation Gas Supply—Proposed Reduction in Price 185
Bury Corporation Gas Supply—The Manager's Annual Report . 186
The Tonbridge Gas Company and the Gas Supply of the District . 186
Electric Lighting Notes 187
Notes from Scotland. 187
Gas and Water Companies' Stock and Share List. 188
Current Sales of Gas Products. 189
Coal Trade Reports 190
PARAGRAPHS:—
OBITUARY: Mr. George Miller; Mr. William Robertson; Mr. Dennis Adams, J.P. 174
PERSONAL: Sir John Wolfe Barry; Mr. Thomas Watson; Mr. James Lee; Mr. W. S. M'Gregor; Mr. Chaney; Mr. John W. Morrison; Mr. Douglas F. Colson; Mr. George Beilby . . . 174
Sterilization and Purification of Drinking Water 163
The Spontaneous Combustion of Coal 168
The Dangers of Electric Currents—"Le Mois Scientifique et Industriel"—Scraping a Water-Main at Plymouth 173
The Treatment of Boiler Waters by Sodium Aluminate—The Utilization of Blast-Furnace and Coke-Oven Gases 174
A Pipe-Coupling Company. 177
The London County Council and the Water Question 179
The Lighting of New York City 182
The Consumption of Water in Crewe—Bury St. Edmunds Public Lighting—Incandescent Gas *v.* Electric Lighting in Douglas—The Disposal of Gas Profits at Middleton 183
The Danger of Blowing Out the Gas. 187
Subways in New York—Explosion at the Beckton Chemical Works—Newmarket Public Lighting—Extension of Plant at the Driffield Gas-Works—Death from Suffocation by Coal Gas—Coventry Gas-Fittings Company, Limited—Electric Lighting and Gas Supply in Carlisle 190
The Fire at the Guildford Gas-Works—Value of Land Taken for Reservoir Purposes at East Finchley—Brynmawr and Blaina Gas Company, Limited—Reductions in Price—Sales of Shares—Projected Gas Exhibition at the Royal Aquarium—The Supply of Gas in Stockton Out-Districts 191
Divination for Water—Wolverhampton Corporation Water Supply—Kingsbridge Water Supply—The Risks of Well-Sinkers—Additional Pumping Plant for the Slough Water Company—Boston (Lincs.) Gas Company—The Winding Up of the Kettering Water Company 192

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EDITORIAL NOTES.

Mr. G. Beilby on the Industrial and Domestic Uses of Fuel.

THE Society of Chemical Industry held their Annual Meeting in Newcastle-upon-Tyne last week, under the presidency of Mr. George Beilby, of shale oil and cyanide fame. The only contribution to technical literature customary on these occasions is the President's Address, the rest of the time being chiefly occupied with social functions and visits to works. Mr. Beilby, being a dweller in the borderland of the gas industry, on the oil side, had a good deal to say upon a number of topics of more than passing interest for gas engineers. The subject of the national store of fuel and its utilization having been publicly discussed several times of late, Mr. Beilby took it in hand with the object of exhibiting it to the world from his own particular point of view; and a very striking and suggestive picture was the result. Among other points brought out, was the wide margin that remains for the recovery of the residual products of the carbonization of coal in the coke and other coal-consuming industries. If the beehive coke-ovens were entirely replaced by recovery ovens, the output of gas, tar, and sulphate of ammonia of the actual British gas industry would receive an addition of very nearly equal quantity and weight. After this, there still remain 137 million tons of coal, now burnt for various purposes in the raw condition, very largely to waste. If any material part of this enormous weight of coal were converted into gas and the other chief products of carbonization, previous to its use as fuel, an altogether new condition of things would ensue.

To bring the question to a practical issue, Mr. Beilby suggested that increased attention should be given to making fuel briquette. Gaseous fuel will not do everything; and it is Mr. Beilby's belief that with skill and enterprise briquettes compounded of coke and pitch can be made to suit every purpose from boiler firing to domestic cooking. Gaseous fuel is the most suitable form of combustible for chemical and metallurgical purposes; but the President favoured its generation and distribution to distances of a mile or two, instead of leaving it to be manufactured on the spot as and where required. His reason was that factory owners will not be troubled to add to their capital expenditure, and also to their anxieties, by becoming gas makers. He thought that much might be done by bringing gentle but uniform pressure to bear upon manufacturers who burn raw coal, and instanced the improvement that has resulted in the case of chemical works from the judicious administration of the Alkali, &c., Works Acts during the past thirty years. It is a telling illustration. There is little room for doubt that if the suppression of the coal smoke nuisance were systematically taken in hand, on the lines of the work already accomplished by the able and devoted Inspectors under the Acts in question, a vast difference in this regard would soon become apparent.

On the subject of the domestic hearth, Mr. Beilby would appear to have been reading his "JOURNAL" with appreciation. There is a vast deal to be done with gas, coke, and smokeless briquettes to the advantage of the British public, and to the benefit of the industries concerned. Indeed, the fringe of this great region has scarcely been touched; but the difficulties of occupying the country are so great that the marvel is that even so much has been achieved. The chief hindrance to progress is the inaccessibility of the speculative builder. As Mr. Beilby truly says, in this matter the co-operation of the architect and the builder with the gas engineer is required. But how is this to be brought about? The speculative builder is not in the business "for fun." His very livelihood depends upon his hitting the public taste, as exhibited to him by the applicants for houses in the "eligible neighbourhood" which he may happen to be engaged in "developing." A bit of stained glass, an extra cupboard, will arrest the fancy of the questing couples who are the builder's mainstay; and he must gratify them, or else lose his rent. All this puts a premium upon meretricious house building. Yet there is a gleam of hope in the prospect; and it lies in the consideration of "reletting." The worst order of speculative builders are driven to take up one surburban estate after another, covering the land with brand-new brick-and-mortar boxes, because the first three years' occupancy takes all the shine out of the previous settlement, and the original respectable tenants flee from it. The walls crack,

the woodwork shows through the paint, the ceilings fall' the partitions gape, the doors will not shut nor the windows open. The property is not worth the mortgage. The builder has no further interest in it. The lender forecloses, and reduces the rent; and another "slum" is created. It should not be beyond the resources of civilization to impose a check upon this progressive degradation of building estates, by putting up something in the first place which will last at least a lifetime, and by building houses to live in rather than to let once. Is there nothing attractive in the recommendation of a house as being wind and weather tight, warm in winter, cool in summer; a house in which one servant can do the work that would take two in another one of the same size; a house capable of being made thoroughly comfortable with half the usual coal bill? That is the question which, if men were governed by reason, would interest fathers of families more than most of the considerations that actually influence them when out house-hunting.

The Passing of the London Government Bill.

THE Royal Assent given last week to the London Government Bill marks the successful issue of a controversy that has raged, in fits and starts, for thirty years and more. How to make some better provision for the self-government of London has been a poser for all practical statesmen and publicists who have asked themselves the question; and the answer has been choked off from the very outset by the obvious, even glaring, indifference of the Metropolitan population to the whole subject. It is comparatively easy to help people who are ready and anxious to help themselves, in the matter of local self-government, as in other human affairs. The cause of parliamentary and municipal reform in this country has prospered because the constituencies and boroughs generally have co-operated in the work of advancement and improvement. London, however, whether for good or for evil, is not in the least like other towns. The population have no feeling of local patriotism, as have other townspeople. The difference shows itself in many ways, and nowhere more conspicuously than in the newspapers of the Metropolis and the great Provincial centres. The conductors of the London daily papers fill their sheets with news and articles relating to everything and anything but exclusively London affairs; whereas (say) a Manchester paper is first of all a paper for Manchester people. By the new Act, Parliament has started the experiment of asking the owners and ratepayers of the various well-recognized Metropolitan topographical divisions to interest themselves in the local government of these districts, some of which have hitherto been "names and nothing more," by the inducement of constituting them boroughs with their councils composed of mayors, aldermen, and councillors. The proposal, and the manner in which it is to be carried into effect, are probably the least possible alteration that could have been made in the older system. The average Londoner is not asked to do very much more than he has been in the habit of doing, at any rate to begin with—which is probably the wisest course that could have been taken. All experience shows that it is a blunder to force complicated and highly developed forms of government upon communities not prepared to use them fully and properly. Governments at best are necessary evils. They always go bad when there is no fresh breeze of healthy public opinion blowing through them. Once get the people of the various Metropolitan districts to take an interest in their borough Corporation, and progressive development of Metropolitan self-government will naturally follow.

It is instructive to notice, by some of the current criticisms of the new measure, how far the mind of politicians has travelled in respect of what goes to constitute local self-government since the early days of municipal reform. A hackneyed criticism of the new Metropolitan boroughs is that these bodies will not possess many of the most prominent functions of the Provincial bodies of the same name—such as the supply of gas and water, tramways, and so forth. The self-styled "Progressive" party in municipal politics raves furiously over this deprivation, and almost declares that if the typical London borough of the future cannot "keep shop," there will be hardly anything else worth its while to do. Now, it is one of the most interesting features of the London boroughs, from our point of view, that they will have nothing, or next to nothing, to do with trade, in any shape or form, but will confine themselves to purely administrative duties. Their work will be strictly that of governing their districts according to the requirements of law. Some of them will have the raising and expending of revenues equalling those of the biggest Provincial Municipalities; but there will be no commercial complications of the accounts. A merciful dispensation has relieved the Metropolitan borough councillor of the necessity for taking thought for the police, for hackney carriages, the disposal of the sewage, and a crowd of other penible and costly responsibilities. He will be subject to no temptation to "rob Peter to pay Paul," but will be left free to show his husbandry of the rate fund while helping to make his part of London worthier as a place of residence or business of the citizens of the greatest Metropolis the world has ever known. This is surely a worthier ambition than the making of "profits" out of users of municipal monopolies.

The Honley Gasholder Accident.

As already recorded in our news columns in last week's issue, there was a serious and fatal explosion of gas at the works of the Honley Gas Company, while Messrs. Robert Dempster and Sons' men were engaged in cutting up an old holder. Four men were killed, and another was seriously injured, in the accident, which was of a kind that is now extremely rare. The holder was a counterbalanced single lift, 48 feet by 14 feet; and it was in use up to and during Monday, the 3rd inst.—the day before the explosion. Messrs. Dempster's men arrived on the Monday; and the Gas Company's men then let the holder down upon the rest-stones. The same evening the works foreman took out the usual 1½-inch plug from the crown; but it was not until the following morning that the manhole was opened. In the reported proceedings at the inquest, the Secretary and Manager of the Gas Company is recorded as having admitted that this should have been done three or four days before. He also admitted that nothing was done to test the quality of the gaseous mixture in the holder. The foreman's evidence on the same point was also significant. Within three or four hours of a summer's day after air had been admitted into the crown of this disused holder, the unfortunate platers started cutting the sheeting. The natural consequences duly followed. A spark from the cold chisels ignited the highly-explosive mixture in the crown; and the holder was blown into the air. It is the loss of life, of course, and personal injury, that makes the affair so serious for the Company. The verdict of the Coroner's Jury runs to the effect that the deceased men were accidentally killed; but it has a rider "that proper precautions should have "been taken to ascertain that the gas had been exhausted "from the holder before allowing the men to commence "work upon it." This is as much as to say that proper precautions were not taken; and the Company will find the omission a costly one. We cannot wonder at this verdict; and, indeed, any other would have been a miscarriage of the inquiry. It would be a dangerous matter to let it go forth that, in sound technical judgment, what was done in this instance to prepare the holder for Messrs. Dempster's men was adequate and proper. Any number of "morals" might be drawn from this deplorable story; but it is far too bad to talk about. Inasmuch, however, as we passed a strong condemnation upon the futility of the Coroner's inquiry into the New York gasholder tank accident, it is but fair to the Yorkshire Coroner and his Jurymen to acknowledge the common-sense, dutiful way in which they did their work in this instance. True, the matter was as plain and simple as it could well have been; but so it was in the New York case, where the Jury stultified themselves. The Honley verdict is unimpeachable, on all points.

Differential Charges for Gas and Electricity.

IN recently discussing the question of differential charges for gas supplied to consumers for various purposes, we referred to the ingenious experiments of electricity supply undertakers in the same connection. Electricity differs from gas in not being a ponderable substance. It has to be manufactured as required; and the manufacturer has no such means of equalizing his production and his output as the gasholder affords to the maker of illuminating gas. Consequently, it has always been regarded as the true rule for apportioning the charge for electricity supplies that the cost of "making ready" for a consumer's possible demands ought to govern the rate at which he can be served. It is the consumer who wants light just when everybody else wants it—perhaps only for an hour or two—for whom the station engineer has to provide. If he would only spread his requirements over a longer daily period, the station

engineer would be very much obliged to him. Hence the suggestion of adjusting the method of charging so as to exact the highest price out of the consumer of the shortest daily supply, while offering an inducement to the longer nightly use of the lamps connected, is a very natural one in the circumstances. The most famous device of the kind is that known as Wright's, or the Brighton, system, in which the first hour or two hours' daily supply is charged at the top price; a very considerable reduction being made for current taken afterwards. The advantages of this arrangement are recognized at Brighton, where it originated, and in some other places. On the other hand, there are many localities where it is regarded as unsuitable to the conditions of the business. The big London West-end Companies have not taken to it as yet; but it is announced that the Chelsea Company mean to try it at the close of the summer. The statement has aroused our contemporary the "Engineer" to publish an article in its issue for the 30th ult. in which the whole system is elaborately discussed. It is admittedly not an easy way of levying the rate payable by the individual consumer, who hardly ever understands it. The funny thing about the "Engineer" article is that the writer laid himself open to correction a fortnight later, by a correspondent of the same journal, who showed that he did not state the principle accurately. This is very bad; for if a consumer of a commodity does not understand the way in which his bill is made out, what reasonable security has he against a fraudulent charge? We should like to see one of these Wright's bills contested before two Justices, as in the case of a disputed gas bill. One of the best things in the letter of correction referred to is the following passage: "Wright's system was not designed for the benefit of the "consumer, but rather for that of the supply company." Of course, the two interests are identical in the end; but the naïve confession that a differential system of charging is started in the interest of the producer so aptly discloses one of the reasons why consumers regard such devices with suspicion, that it is worthy of being recorded.

Names for Proprietary Articles.

A PASSING remark of our excellent contemporary the "Ironmonger," on the subject of the names given to proprietary articles in the hardware line, is timely, and worthy of the support of educated opinion. It relates to the lack of originality displayed by those who put their goods upon the market under such hackneyed titles as "Excelsior," "Acme," "Climax," and the like, "of which there are "already some hundreds at present in use, causing great con- "fusion, heartburning, and loss of time." The complaint is just. It is extremely irritating to have to commit to memory, in connection with a particular make of steel pen, one of these meaningless words which may previously have been associated in the mind with a mowing-machine. It is notoriously even more difficult to find a new name for a thing than to originate the thing itself. The great American nation are popularly supposed to excel as inventors, yet when one notices the poverty of their new place-names, and the way in which they fall back upon the old English ones, the suspicion is engendered that the inventive and creative faculties are more distinct than is generally believed. It is the same with the names of hardware and tool "lines." Let us have no more "Acme" stoves; but if a thing must be distinguished in this way, let it be by a number or a "mark." We shall learn to ask for "Jones's Number "Twenty-Nines" quite as readily as "Jones's Excelsiors." Some groups of numerals stick in the memory as firmly as catch-words, while others cannot be remembered from one day to another. The appropriate combination must be found every time.

The Sterilization and Purification of Drinking Water.—A series of experiments carried out by M. Bergé, in conjunction with MM. A. Bergé and E. Stein, in regard to the water-sterilizing power of chlorine peroxide, have been described in the "Annales des Travaux Publiques de Belgique," and epitomized in the "Journal of the Society of Chemical Industry." The gas (ClO_2) can be prepared without danger, at ordinary temperature, by the action of sulphuric acid on potassium chlorate. Complete sterilization was induced by this gas, which it appears can be used in various ways for treating large quantities of water. Ozone has been tried by MM. Marmier and Abraham for the sterilization of water on a commercial scale, and the results of their experiments have been described in the "Comptes Rendus." The water supply of Lille has been treated by their process. On account of the destruction of organic matter, the water is less liable to subsequent putrefaction.

THE PRIZE ESSAY ON SULPHATE OF AMMONIA.

IN the "JOURNAL" a fortnight ago we were able to announce the decision of the Judges—Mr. J. Bowen-Jones, of Shrewsbury, and Dr. J. A. Voelcker, of London—in the matter of the award of the prize of 500 guineas offered by the Sulphate of Ammonia Committee for the best essay on "The Utility of Sulphate of Ammonia in Agriculture." As previously mentioned, out of the 73 essays sent in, that submitted by Mr. JAMES MUIR, M.R.A.C., formerly Professor at the Royal Agricultural College, Cirencester, subsequently at the Yorkshire College, Leeds, and at present Instructor in Agriculture to the Somerset County Council, was considered by the Judges to have best fulfilled the conditions laid down by the Committee. In view of the interest with which the work of the Committee in this matter has been followed, we are pleased to be in a position to commence to-day the publication of Mr. Muir's essay—the instalment now given being about one-fourth of the whole.

THE UTILITY OF SULPHATE OF AMMONIA IN AGRICULTURE.

By JAMES MUIR, M.R.A.C.

More than half a century ago, in dealing with the subject of the "Food of Plants," Fownes wrote as follows: "I beg once more to call attention to the salts of ammonia. Should these really be found to produce the beneficial effects anticipated, we shall possess at home, within the limits of our own island, resources for the improvement of agriculture compared with which guano, and nitrate of soda, and all such things, are quite insignificant—resources which only require to be judiciously used to produce the most extraordinary results."*

This prediction was made when the value of nitrogenous manures was very little understood, and when artificial top-dressings in particular were undergoing their first trials, and were regarded with great suspicion by the majority of agriculturists. Subsequent discovery and research have proved the general correctness of the forecast, though the judicious use of salts of ammonia is not met with as often as might be. It is the object of this essay to point out the manner of action of sulphate of ammonia; and, relying only on results of actual experiments, to show how it may best be used on the various crops of the farm with a view to profit.

MANUFACTURE OF SULPHATE OF AMMONIA.

Sulphate of ammonia, in common with other compounds of ammonia, is obtained chiefly as a bye-product in the manufacture of coal gas. When coal is heated in the retorts to drive off the gas, most of the nitrogen it contains combines with hydrogen, also found in the coal, to form ammonia—a gas consisting of fourteen parts by weight of nitrogen, and three parts of hydrogen. To remove this ammonia from the coal gas, in which it would be a harmful ingredient, the mixture is usually brought into contact with water in a special apparatus called a "scrubber," when the ammonia is dissolved, while the rest of the gas passes on. Steam is blown through this solution of ammonia and condensed in sulphuric acid, when the compound sulphate of ammonia is formed by combination between the ammonia and the acid.

In a similar manner, sulphate of ammonia is obtained from coke-ovens, blast-furnaces, shale-oil works, and to a slight extent in the manufacture of charcoal from bones. In France, a certain amount is derived from the ammoniacal liquids from cesspools. Proposals have also been put forward for producing sulphate of ammonia by the heating and destructive distillation of wool refuse and other animal matter containing nitrogen, and from peat; but these methods are not yet of practical importance.

The production of sulphate of ammonia in this country has steadily increased for a number of years; the output having risen from about 75,000 tons in 1883 to 151,500 tons in 1893. The amount produced in the whole of Europe at present is estimated by Sir William Crookes† at about 400,000 tons per annum.

* "Journal of the Royal Agricultural Society of England," Vol. IV.
† British Association Presidential Address, 1898.

Sulphate of ammonia belongs to the class of *Nitrogenous Manures—i.e.*, those which are valuable for the nitrogen they contain. We must, therefore, consider it as a source of nitrogen only; bearing in mind that if crops require other substances, they must be supplied from other sources. We will, therefore, first deal with the plants' requirements as to nitrogen, and the effect of nitrogenous manurings generally.

Substances Essential for Plant Growth.

There are in all ten substances which are absolutely essential for plant growth—that is, if any one of them is deficient or absent from the soil, the crop grown will be deficient or will fail accordingly. Many other substances are usually taken up by plants; but these can be dispensed with. Of the essential elements, the majority are supplied naturally in ample quantity—carbon chiefly by the carbon dioxide (carbonic acid) in the air, hydrogen and oxygen in water, lime, magnesia, iron, and sulphur as constituents of the soil; though, as we shall see, the quantity of lime may be deficient. We find, therefore, that the substances that the farmer must supply to his crops are usually only the three—nitrogen, phosphates, and potash; and even of these, potash is sometimes not required, as it often occurs in large quantities in the soil.

Natural Supplies of Nitrogen to the Plant.

Of all the essential constituents, nitrogen is most likely to be lacking in any state in which it can be used by plants. There is, of course, an unlimited quantity of free nitrogen in the air; but in that state it is useless, for plants can only take it up when it is fixed or combined with oxygen or some other element. Combined nitrogen is supplied naturally in rain-water, and in dew and hoar-frost; but the total average quantity so added to the soil was estimated at Rothamsted* to be only about 4½ lbs. per acre per annum—a good deal less than is required by any ordinary farm crop.

Clover, beans, and other leguminous plants make the soil on which they grow richer in combined nitrogen. It was first shown by Hellriegel and Wilfarth that this family of plants normally have on their roots small nodules, containing bacteria which have the important power of using the free nitrogen of the air, and preparing it for the use of their hosts. The amount of nitrogen thus obtained, and left in the soil as root and leaf residue, is often very large. These facts must be remembered when we come to deal with the effects of nitrogenous manures on leguminous crops.

Losses of Nitrogen from the Soil.

Whatever the quantity of nitrogen in the soil it is always liable to loss, apart from its removal by crops. Nitrogen in the soil may be said to be always in one of three forms—viz.:

1.—Nitrogenous organic matter.

2.—Ammonia.

3.—Nitrates.

In the first form, as organic matter—*i.e.*, the remains of plant or animal life—the nitrogen is for the most part safe from loss. Sooner or later, however, it is liable to be acted upon by bacteria in the soil, and changed into the second form, when in the majority of soils it is still retained; clay and humus being able to hold or "fix" ammonia, while sand, gravel, and lime have no *absorptive power*, as it is called. Eventually organic and ammoniacal nitrogen will undergo a further change, through the action of micro-organisms, and will be converted into the third form—that of nitrates. It is then that serious loss takes place; for nitrates cannot be retained permanently by any soil, but are lost by drainage following rain. More will be said with regard to both the absorption of ammonia by soils and the formation of nitrates, when considering the action of sulphate of ammonia.

Increase from Nitrogenous Manuring.

Seeing, then, that the natural supply of nitrogen to the soil is generally insufficient for the farmer's needs, and that loss is continually occurring, it is obvious that the supply of nitrogen in suitable form and quantity must increase the return from the land, and, indeed, must be an essential part of farm management. Both field and laboratory experiment, as well as general agricultural practice, fully bear out this conclusion. Out of the great mass of evidence as to the effect of nitrogenous manures, the following summary may be chosen of the average produce obtained from the use of nitrogen on various crops at Rothamsted; each crop being grown continually on the same land, in most cases for a long series of years.

* "Journal of the Royal Agricultural Society of England," Vol. XIX., S.S.

Table I.

Crop.	Mineral Manures.	Ammonia Salts.	Minerals and Ammonia Salts.
	Bushels.	Bushels.	Bushels.
Wheat	15	20½	33½
Barley	22⅜	29	43½
Oats	24½	47	59
	Tons. Cwt.	Tons. Cwt.	Tons. Cwt.
Mangels (roots)	5 2	6 6	14 13
Swedes	2 9	0 13	4 9
Potatoes	3 7¾	1 17¾	5 18⅞

Comparing the produce with mineral manures, which include phosphates, potash, &c., and that with mineral manures and ammonia salts, we at once see the immense gain from the use of nitrogenous manures. In the case of three of the six crops mentioned—viz., wheat, oats, and mangels—the nitrogen added to the mineral manures more than doubled the crop, and with barley it nearly doubled it.

It will be noticed, however, that the produce with ammonia salts only was not nearly so large as with mineral manures and ammonia salts together, and in two cases was below that from minerals only. Neither minerals alone nor ammonia salts alone could produce such a good crop as when they are used together. Indeed, this follows from what has been already said. The mineral manure supplies all the essential constituents of plant food except nitrogen, while ammonia salts supply nitrogen, but nothing else. Therefore, with the application of either for a series of years on the same land and crop, some essential substance will soon become deficient, and the produce will fall off in proportion. When both minerals and ammonia salts are used, however, everything necessary is being supplied, and a full crop may be obtained. It is not strictly accurate to say that the difference between the produce with minerals and that with minerals and ammonia salts is due entirely to the ammonia salts. It is rather due to both manures being able to give their full effect when used together.

In passing, it may be noticed that many misleading results have been obtained in trials of manures—particularly in field experiments—for want of proper appreciation of the interdependence of the different classes of manures.

In ordinary farm practice, however, the soil is usually more deficient in nitrogen than in minerals, and then, from the farmer's point of view, the increase shown by the addition of a nitrogenous manure may be fairly credited to the manuring. To illustrate the effects of nitrogen on ordinary farm crops grown in rotation, the results obtained in experiments carried out in the year 1886 by the Norfolk Chamber of Agriculture, in conjuncture with the Royal Agricultural Society* may be taken as fairly representative. They are as follows:—

Table II.

——	Phosphates and Potash.				Phosphates, Potash, and Nitrogen. Average of Various Dressings.			
Crop.	Corn.		Straw.		Corn.		Straw.	
	Bush.	Cwt.	Qrs.	Lbs.	Bush.	Cwt.	Qrs	Lbs.
Barley after swedes	44·5	25	1	26	53·93	28	0	22
Barley after wheat	34·8	18	1	17	38·59	22	2	25
	Tons.	Cwt.	Qrs.	Lbs.	Tons.	Cwt.	Qrs.	Lbs.
Swedes (average of three farms)	15	4	1	3	18	5	2	6
Mangels	17	5	3	20	21	12	0	23

In every case, a larger crop was grown where nitrogen was supplied in addition to phosphates and potash, though, as might be expected, the difference was not so great in proportion as in the Rothamsted experiments, where cropping and manuring were continually the same year after year.

In the Norfolk experiments, no plots were dressed with nitrogenous manure only. An experiment carried out at Pontefract under the direction of the Agricultural Department of the Yorkshire College in 1895 gave typical results as to the effect of nitrogenous manuring alone on swedes on ordinary farm land. Phosphates and potash gave 18 tons 2 cwt. 16 lbs. of roots per acre; with nitrogen in

* "Journal of the Royal Agricultural Society of England," Vol. XXIII., S.S., Part 1.

addition, 19 tons 12 cwt. 46 lbs.; but nitrogen alone gave only 15 tons 8 cwt. 94 lbs.—the order of the produce of different manurings being the same as that with swedes at Rothamsted. Here, then, we see that nitrogenous manures used by themselves are not to be relied on for crops grown in the ordinary course of farming, any more than under the conditions of experiment at Rothamsted. We shall have occasion to refer later to many other instances of the same thing.

Do Nitrogenous Manures Impoverish the Land?

Something must be said on the common idea amongst farmers that nitrogenous manures are exhausting to the land. Obviously, if larger crops are grown by the use of nitrogenous manures, and these crops therefore remove larger quantities of phosphates and potash, the land will be so much the poorer in those substances. If its fertility is to be kept up, they must be returned to the soil in the form of manure. But that is no reason why nitrogenous manures should be considered as mere stimulants, and not as plant food. A favourable season might equally well be considered exhausting to the land; for it produces large crops which, of course, remove more plant food from the soil than small ones would take up. With regard to lime, however, manures in which the nitrogen is in the form of salts of ammonia are exhausting; for they cause it to be carried away in the drainage from the land. This is, of course, of most practical importance on soils deficient in lime, which in other ways are less suitable for ammoniacal manures than those in which lime is abundant. The whole question as to the advisability of using nitrogenous manures becomes one of money. If the cost of the extra manures used, both to produce the crop and to compensate for the extra demands made upon the land, is greater than the increased returns that may be expected from their application, nitrogenous manures will not be remunerative. This, however, is very seldom the case on ordinary farm land, for the judicious and moderate use of nitrogenous manures enables the crops to make use of mineral matter which would otherwise lie idle in the soil.

Effect of Nitrogenous Manures on the Plant.

Having satisfied ourselves that the proper use of nitrogenous manures is advantageous, we may pass on to consider generally their action on plants.

Comparing plants grown with a full supply of nitrogen with those receiving little, the most noticeable difference is that, if all other conditions for healthy growth are fulfilled, the plants receiving nitrogen produce a much larger leaf growth of a very dark colour. The importance of this will be recognized when it is remembered that the leaves are the organs by which the plant feeds on the air—taking the element carbon from the carbon dioxide which the air contains; and that the green colouring matter, called chlorophyll, is the necessary agent in this action. The nitrogen may thus be said to increase the apparatus of the plant for the assimilation of carbon. Mineral substances are necessary for the building up of the carbon into such compounds as starch, sugar, and cellulose, which are called carbohydrates. Potash particularly seems to be needed for this purpose—an important fact, to which we shall refer again.

Another effect resulting from the use of nitrogenous manures is that the maturing of the plant is somewhat hindered, especially if the manure is applied late in the crop's growth. Provided the crop is grown early enough in the season to allow of its maturing properly, this is no disadvantage, as it gives the plant a longer time in which to grow and collect food from the air and soil. The late application of these manures, however, is to be avoided, as we shall see later.

In this connection it is worth noticing that, in the Woburn wheat experiments, ammonia salts appeared not to delay the ripening of the crop so much as nitrate of soda.

The net effect of the increase of leaf and chlorophyll, and of the lengthened period of growth, is the apparent anomaly that a very large increase of non-nitrogenous material is produced by the use of nitrogenous manures. For example, at Rothamsted Sir John Lawes and Sir H. Gilbert estimate a very large gain per acre in carbohydrates (starch, sugar, &c.) from manuring with nitrogen and minerals, as compared with minerals only, in all the chief crops under experiment. The gain in carbohydrates for each pound of nitrogen in the manure was as follows, on the average of several plots dressed with nitrogen in different forms and quantities per acre—

Table III.

Crop.	Carbohydrates per Pound of Nitrogen in Manure. Lbs.
Wheat	31·0
Barley	46·3
Sugar Beet	42·1
Mangels	29·9
Potatoes	17·0
Beans	5·5

How Nitrogen is taken up by Plants.

Like all the substances taken up by the roots of plants, nitrogenous matter is only useful when in a state of solution, for plants have no power of absorbing insoluble material. In this respect, sulphate of ammonia and other ammonia compounds are quite suited to the requirements of plants, being freely soluble in water.

The three forms of nitrogen in the soil differ in their usefulness to the plant. Organic nitrogen is for the most part useless, and must be regarded as a reserve which is gradually drawn upon as the nitrogen is converted into other forms. Ammoniacal and nitric nitrogen are, however, both useful to plants. Nitric nitrogen is taken up readily, and is often stored up in the plant for a time. Under favourable conditions—a suitable temperature and the presence of carbohydrates in the plant being especially necessary—it is gradually changed into various organic substances, such as amides and finally albuminoids.

Ammoniacal nitrogen may also be directly used by plants. Owing to the fact that, under natural conditions, most of a crop's nitrogen, if not the whole of it, is taken up in the nitric form, statements are frequently met with to the effect that ammoniacal nitrogen cannot be directly used by plants. That this, however, is not the case has been shown by many investigators. A. Muntz grew various plants in a soil the only nitrogen of which was in the form of sulphate of ammonia; and though taking full precautions against nitrification, he found that the plants took up large quantities of the nitrogen.* About thirty years ago Hampe had come to the same conclusion,† but found that, in the early stages of growth, plants seemed less able to use ammoniacal nitrogen; and Wagner and others have obtained similar results. We may assume, however, that ammonia is not taken up so readily as nitric nitrogen—*i.e.*, nitrogen in the form of nitrates; and under practical conditions the ammonia of manures is almost always converted into the nitric form before being used by plants.

Though nitric nitrogen is stored up in the plant for a time, until circumstances allow of its being utilized, ammonia compounds are not to any appreciable extent, but are converted at once into a substance called asparagine. This can only be formed when carbohydrates are present. If they are deficient, compounds of ammonia act as plant poison—sulphate of ammonia perhaps least so.‡

In connection with this action, and the importance of the presence of carbohydrates in the plant when ammoniacal manures are used, it is worth repeating that mineral manures, and potash particularly, are necessary to enable the plant to form carbohydrates. There sults of many experiments seem to show, as we shall see, that by withholding a full supply of potash from the soil, the action of ammonia compounds is more injuriously affected than that of other forms of nitrogenous manures.

The asparagine and other amides formed are not the final product from the nitrogen which the plant takes up. In the mature plant particularly, albuminoids are found in considerable quantities, these being formed from the amides. Among other requirements for their formation, besides those already mentioned, it is worth noticing that the presence of a sulphate is essential. As Liebig pointed out,§ sulphate of ammonia may gain in effect from this cause; but the cases in which it does so must be few, for sulphates are practically always present in the soil in sufficient quantity for the plants' requirements.

Absorption of Ammonia by Soils.

We may now pass on to consider what happens when sulphate of ammonia is applied to the soil. The actions and changes to be described take place in the same way with other compounds of ammonia, but the sulphate is the form

* "Comptes Rendus," 109. † Vs. St., 10. ‡ Bul. Coll. Ag. Imp. Univ. Tokyo, 1895. § "Chemistry of Agriculture and Physics." Third Ed.

almost always used as manure, and for the present concerns us most.

When first applied to the land, sulphate of ammonia, being readily soluble in water, is dissolved by the water which the soil contains. When used as a top-dressing, especially on grassland, so that it does not come into close contact with the soil, it may sometimes remain undissolved until rain falls; but the soil generally contains enough water to dissolve it, if it is in close enough touch with it.

In a state of solution, the sulphate of ammonia spreads all through the soil; and unless some change takes place in its condition, it may be gradually washed away in the drainage from the soil. We have already referred to the fact that clay and humus in a soil have the power of fixing or absorbing ammonia; and, of course, the majority of soils contain a certain proportion of one or both of these constituents. In what way the ammonia is fixed, is not clearly understood; but it is probably chiefly by chemical combination, though capillary action may possibly assist in retaining it.

The humus and clay of the soil, however, can only absorb ammonia when it is either in the free state—*i.e.*, not combined with other substances—or in the state of carbonate. The ammonia of sulphate of ammonia must, therefore, be converted into one of these forms before it can be fixed. This is brought about by chemical action in the soil between the sulphate of ammonia and carbonate of lime, a substance which most soils contain. It will be remembered that sulphate of ammonia is a compound of ammonia and sulphuric acid, and carbonate of lime consists of lime and carbonic acid. When these two substances come into contact in the soil, an exchange takes place; the ammonia and carbonic acid combining to form carbonate of ammonia, and the lime and sulphuric acid forming sulphate of lime. That this action does really take place, is shown by the fact that after the application of sulphate of ammonia to the land the drainage water contains large quantities of sulphate of lime, and little or no ammonia.

The carbonate of ammonia thus formed can then be absorbed and fixed by the clay and humus, when it is practically safe from loss by drainage—at least, until nitrification takes place. Brustlein has shown experimentally that without the presence of carbonate of lime, absorption of ammonia does not take place when it is applied in the form of sulphate, or any other compound of ammonia except the carbonate.

The requirements for the absorption of ammonia applied as sulphate may therefore be summarized as:—

1.—The presence of enough carbonate of lime in the soil to convert the sulphate into carbonate of ammonia.
2.—The presence of clay or humus to absorb the carbonate of ammonia thus formed.

It must not be understood that these actions are immediate or complete. It is a common mistake, and one which leads to a good deal of confusion of idea, that chemical action takes place as readily and completely in the soil as in the beakers and test-tubes of the chemist's laboratory. It is really quite otherwise; and in the case we are considering, some sulphate of ammonia may remain unchanged for a long time, though the supply of carbonate of lime is plentiful. As this sulphate sinks lower and lower in the soil, most of it is gradually converted into carbonate, and is then fixed; but probably many other actions take place, though generally on a small scale and with quite unimportant results.

Possible Loss of Ammonia when Applied as Sulphate.

Carbonate of ammonia which results from the interaction of sulphate of ammonia and carbonate of lime is a very volatile substance—that is, when exposed to the air, it gradually disappears in a state of vapour, unless previously fixed by the clay or humus of the soil. It has, therefore, been suggested that, on light calcareous soils—*i.e.*, those rich in carbonate of lime, and deficient in clay and humus—serious loss of nitrogen must take place, owing to the rapid formation of carbonate of ammonia, and the want of enough absorbent material in the soil to save it from volatilization. The amount of this loss, however, has been probably exaggerated, and is hardly appreciable, except in cases where the land is particularly rich in carbonate of lime. Even then, according to Pechard,* the loss is prevented if sulphate of lime is present; for this tends to convert the ammonia in the soil into sulphate of ammonia. As to what occurs under ordinary conditions, Muntz found in an experiment on a light soil, containing 2 per cent. of lime, that the ammonia given off into the air was only at the rate of 8¾ grains (0·56 gram) per acre per day, during the first five days after a dressing of sulphate of ammonia at the rate of 4 cwt. per acre—a heavy dressing. Where farmyard manure was employed, the amount of ammonia lost in the same time was 25 grains per acre per day. These quantities are so small that they may be safely neglected in practice, especially as we may assume that the amount of ammonia given off into the air would be greatest during the first few days after the manure was applied—at any rate in the case of sulphate of ammonia. Other experiments with a variety of soils have shown even less loss of ammonia.

* "Comptes Rendus," 109.

Nitrification.

It has been said already that though plants can make use of sulphate of ammonia and other ammonia compounds, yet they can use nitric nitrogen more easily, and do, in fact, take up most of their nitrogen in that form. Nitrification, or the process by which the ammoniacal nitrogen is changed into the nitric form in the soil, must therefore next be considered.

In a general way, nitrification may be described as a series of changes in which nitrogen is taken from its various compounds in the soil, and made to combine with oxygen obtained from the air to form nitric acid. Like other acids, this combines with any of the substances which the chemist calls bases, to form compounds called nitrates.

Conditions Necessary for Nitrification.

These reactions depend on the presence and activity of micro-organisms or bacteria in the soil. It has been shown by Warington* that there are two different organisms concerned in this action, one of which converts the ammonia into nitrites—compounds in which the nitrogen is combined with a smaller proportion of oxygen than in nitrates—and the other acts on the nitrites, causing their further oxidation, with the formation of nitrates. From a practical point of view, we may consider their actions as a single process; for, under the conditions existing in the soil, the two organisms are equally active. If, however, they are to cause free nitrification, the soil must be suitable for them.

In the first place, it must contain nitrogen for the organisms to convert into nitric acid. This nitrogen may be in the form of either organic matter or compounds of ammonia, the latter being more readily acted upon.

If the nitrogen is present as ammonia, there must also be organic matter in the soil to act as food for the organisms; for like other living things—both animals and plants—they only thrive when they have enough food. If the nitrogen is in the form of organic matter, the latter will, of course, serve the double purpose of supplying nitrogen and feeding the organisms.

A supply of oxygen is also necessary to enter into combination with the nitrogen, for it must be remembered that the process of nitrification consists essentially of the oxidation of nitrogen in the soil. This oxygen is, of course, derived from the air; and from this point of view the texture of the soil, and the freedom or otherwise with which the air permeates it, are highly important, by influencing the facility with which nitrification can take place.

Moisture is also essential for nitrification. Provided the soil is not water-logged, a large amount of water in the soil seems to assist the action of the nitric organisms; while if the supply is insufficient, their activity is hindered or ceases. Schlœsing obtained the following results in a long-continued series of experiments bearing on this point:—

Table IV.

——	I.	II.	III.	IV.
Water in soil, per cent. .	9·3000	14·6000	16·0000	20·0000
Nitric acid formed per 1000 parts of soil in first thirteen months .	0·1570	0·1720	0·3970	0·4780
Nitric acid formed per 1000 parts of soil in next six months . . .	0·0289	0·0488	0·0530	0·0866

These figures show clearly that the amount of nitric acid formed is greater or less according as the soil is more or less moist. It must be noticed, however, that the

* "Journal of the Chemical Society," 1891.

amount of nitric acid formed is not in strict proportion to the amount of water in the soil, but is, on the whole, proportionately greater in the moister soils. Thus, comparing Column IV. with Column I., we see that in the former, which is little more than twice as moist, about three times as much nitric acid was formed during each of the two periods of experiment.

A certain degree of warmth is also necessary for the action of the organisms. Below a temperature of about 40° Fahr., they are practically inactive; but with greater warmth, nitrification becomes more and more rapid up to about 95° Fahr., which is the most favourable temperature. Above that, the rapidity of nitrification very soon becomes less, and at about 120° Fahr. practically ceases. Muntz found the following quantities of nitric acid formed in similar nitrifying solutions kept at the temperatures named for nearly two months:—

TABLE V.

Temperature. Deg. Fahr.	Nitric Acid Formed. Milligrams.	Temperature. Deg. Fahr.	Nitric Acid Formed. Milligrams.
41 to 46	2·3	98	98·9
57 „ 61	19·5	109	40·3
73	39·4	120	5·1
80	59·7	133	0·0
91	81·8		

There is here a steady increase in the amount of nitric acid formed, corresponding to each increase of temperature up to 98° Fahr., after which the quantity falls off rather rapidly with each further increase.

For the continued action of the micro-organisms, it is also necessary that the soil should contain some "base"—that is, some substance which can combine with nitric acid as it is formed, taking away its acid characteristics, and producing a nitrate. If no base is present, the nitric acid accumulates in the soil; and as the organisms cannot continue their action in the presence of any acid, nitrification soon ceases. Almost invariably it is carbonate of lime which acts in this way—nitrate of lime being formed; but other bases, such as potash, are also capable of combining with the acid.

The requirements for nitrification may, therefore, be summarized as—

1.—The presence of the proper organisms.
2.—Nitrogen, either in the form of ammonia or as organic matter.
3.—Organic matter.
4.—Oxygen.
5.—Moisture.
6.—A proper degree of warmth.
7.—Carbonate of lime or some other base.

Conditions Preventing Nitrification.

The conditions adverse to nitrification which are most frequently met with are—

1.—Absence of oxygen.
2.—Absence or deficiency of carbonate of lime.
3.—Presence of acid in the soil.

The absence of oxygen from the soil may be due to the naturally close texture of the latter, as in the case of heavy clays, to imperfect cultivation in the case of arable land, or to the fact of the soil being water-logged, either from its impervious nature or from want of drainage. Whatever the cause, nitrification will cease; and under these circumstances an opposite action—denitrification—may take place, in which, under the influence of micro-organisms which are only active in the absence of oxygen, the nitrates present in the soil are destroyed and the nitrogen lost to the air in a gaseous form.

The absence of carbonate of lime, though not common, is sometimes met with. The obvious remedy is the addition of some form of lime to the land; lime, chalk, marl, and shell sand being all suitable for the purpose.

The presence of acid in the soil is usually connected with one or both of the two foregoing points. When plant refuse or other organic matter decays, various acids are formed (carbonic, humic, &c.). If there is a plentiful supply of carbonate of lime, most of these acids will be neutralized—that is, will have their acid characteristics removed by combining with it, just as we have already seen in the case of nitric acid. Even if carbonate of lime is deficient, these acids may still be washed out of the soil if the drainage is good. On the other hand, if the acids accumulate, the land becomes sour and nitrification ceases.

Rapidity of Nitrification.

Under favourable circumstances, where all the necessary conditions are fulfilled, nitrification goes on with great rapidity. Thus, in two experiments, Schlœsing obtained the following results. In each case the figures show the actual quantity of ammonia and nitric acid respectively present in 500 grams of soil, at the beginning and end of the experiment.

TABLE VI.

Date.	I.		II.	
	Ammonia Milligrams.	Nitric Acid, Milligrams.	Ammonia. Milligrams.	Nitric Acid. Milligrams.
June 13	55·65	..	57·00	..
July 1	5·95	186·50	6·80	206·50

In each experiment a large proportion of the ammonia present on June 13 was evidently nitrified—from 88 to 90 per cent. of it having disappeared by the end of the experiment—and in its place a large amount of nitric acid was produced. It will be noticed that the change was remarkably rapid; the whole time occupied by the experiments being only eighteen days. In a natural soil nitrification will seldom be as rapid as this; but even in ordinary cultivated land, it will often take place very quickly. For instance, the following results were obtained in an experiment on light land on the farm of the French Institute Agronomique in 1888. The amounts of ammonia and of nitric acid in the soil were ascertained on the dates mentioned on two plots, one receiving no nitrogenous manure, and the other manured at the rate of 462 lbs. of sulphate of ammonia per acre. The results are stated per 100,000 parts of the dry soil.

TABLE VII.

Date.	No Nitrogenous Manure.		Sulphate of Ammonia.	
	Ammonia.	Nitric Acid.	Ammonia.	Nitric Acid.
May 8	0·32	1·08	4·94	1·08
„ 10	0·32	1·08	4·94	2·28
„ 17	0·25	1·77	3·00	6·17
June 9	..	1·63	0·65	19·22
„ 14	0·15	1·24	0·49	16·08
„ 24	..	1·03	..	9·73
July 2	0·14	0·57	0·14	1·84

As in the preceding instance the ammonia gradually disappeared from the plot manured with sulphate of ammonia, until the quantity was the same as in that receiving no nitrogenous manure, and nitric acid took its place. That the amount of nitric acid was not greater at any one time is explained by the fact that heavy rain fell frequently during the course of the experiment, and washed much of it away. We may, however, safely conclude that during the season of the year when crops are growing most freely, nitrification takes place very rapidly; and, in this way, a supply of nitric nitrogen is kept up.

We have stated incidentally that, though both organic and ammoniacal nitrogen can be nitrified, yet the nitrogen of ammonia compounds is much more quickly and easily acted upon than that of organic substances. This may perhaps be explained by the fact observed by Schlœsing,* that when the necessary nitrogen is present in the form of nitrogenous organic matter, the nitrifying organism oxidizes not only the nitrogen, but also the carbon and hydrogen of the organic matter. Thus it may be said that the ferment spends part of its energy in other ways than nitrification—ways that are without beneficial influence on the plant. With compounds of ammonia, however, as the source of nitrogen, the organism exercises almost the whole of its oxidizing power on that nitrogen, only taking from organic matter the carbon necessary for its own growth and reproduction.

As influencing our choice of ammonia compounds for use as manure, it is worth noticing that sulphate of ammonia is more readily nitrified than other ammonia compounds. Schlœsing found the following to be rates at which the compounds named were nitrified under favourable conditions:—

Chloride (muriate) of ammonia	55 lbs.	of ammonia per acre per day.
Carbonate of ammonia	67 „	„ „
Sulphate of ammonia	150 „	„ „

* "Comptes Rendus," 109.

These quantities are greater than could be expected in ordinary farm land; but they may be taken as representing the comparative speed with which nitrification takes place.

Loss of Nitrates.

We have seen that when sulphate of ammonia is applied to the soil, the ammonia is in most cases retained by virtue of the absorptive power of the soil, but that sooner or later it is nitrified—a nitrate (almost always nitrate of lime) being formed; the change taking place most rapidly in hot weather and in a somewhat moist soil.

This inevitable and often rapid change is one that must be carefully borne in mind in estimating the probable effects of a dressing of sulphate of ammonia, or indeed of any nitrogenous manure. For while most soils have more or less absorptive power for ammonia, it must be repeated that no soil has the power of holding any nitrate, except in a purely mechanical way, as a sponge may hold water. Therefore when the ammonia has been nitrified, and the resulting nitric acid has combined with carbonate of lime to form nitrate of lime, the nitrogen is then subject to serious loss by drainage after every fall of rain that occurs.

(*To be continued.*)

WATER AND SANITARY AFFAIRS.

It only requires a few days of hot weather to furnish an opportunity to the perfervid newspaper writer to present to the public a gruesome picture of the condition of the Metropolitan Water Supply, and to endeavour to make them believe they are perilously near a water famine. The principal source of that supply—the Thames—is described as being abnormally low; yet, notwithstanding the smallness of the stream, the rapacious Water Companies take half of it, and, in point of fact, draw a great deal more than they are entitled to. The diminished flow is said to be accompanied by increased pollution from the million-and-a-half people living above the Companies' intakes; and, consequently, something akin to liquid sewage is delivered to the thirsty population. So much for the Thames. As to the Lea, its condition is described as just as bad. Its daily flow is stated to be only about two-thirds as much as the East London Water Company require for their customers. At the same time, the well supply upon which the Company depend is getting less every year, and their storage is "falling fast." This was the picture presented early last week by one of the London daily papers, and promptly seized upon and repeated by others in the Metropolis and the Provinces. It is rather curious that it should have been put forward on the morning of the day when the London County Council were to be asked to sanction the expenditure of £3000 in preparing for bringing forward again next session their scheme for conveying to the Metropolis a supply of water from Wales. The story had the effect intended. The money was voted, though not without a protest from Mr. Cohen, who characterized the proposal as the most barefaced one that had been put before the Council for some time.

Although the motive of the article is sufficiently obvious, it may be well to look for a moment at the writer's statements. In his anxiety to make out a case, he was not overcareful about the correctness of his figures. He stated that whereas the Companies were only entitled to take 130 million gallons of water daily from the Thames, they were actually drawing 142 millions, and even more. As a matter of fact, under the legislation of last session, the total quantity the Thames Companies may draw was raised to 150½ million gallons per day; and when the Staines reservoirs are completed the legal maximum will be 35 millions more than this. Then they were stated to be taking half the bulk of an already abnormally reduced stream; whereas they were, we understand, drawing less than one-third, and the period of maximum demand has already passed. Granted that the river is rather low just now. So it was last year; and it recovered its bulk. As the result of the prolonged drought of 1898, the flow of water over Teddington Weir in September was the lowest on record. On one day it was only 42 million gallons; while the daily average for the month was but 77 millions. After September the river resumed its normal condition. In October, the average daily flow was 285 millions; in November, 730 millions, and in December, the high figure of 1513 million gallons was reached. The present flow of the river does not cause any alarm at all to the Engineer to the Thames Conservancy (Mr. C. J. More), who says it will interfere more with the steamboats than with the Water Companies.

An attempt was made to create a scare on the subject of the pollution of the Thames. It is very questionable whether any river in the world is more carefully guarded. The Conservators are by no means indifferent as to the purity of the stream, and last year sixteen convictions were obtained against offending authorities. Of those places from which, at the beginning of 1898, pollution was passing into the Thames or its tributaries, as many as 78 towns or villages, with an aggregate population of more than 180,000, diverted that pollution from the streams; and Mr. C. E. Groves, the Analyst to the Conservators, reports that, owing to the action taken by them, the amount of organic impurity in the water immediately above the Companies' intakes is now only about two-thirds of what it was before the passing of the Act under which the Conservators carry on their operations. Of course it may be said that the river is polluted by the craft upon it. But great vigilance is exercised by the officers of the Conservators over the houseboats and launches; and no case of pollution from them was detected last year. But whatever may be the condition of the Thames water at the intakes, it reaches the consumers in a suitable condition for consumption. According to the report of Sir William Crookes and Professor Dewar for May, the mean number of microbes per cubic centimetre in 26 samples of unfiltered Thames water was 3247; but the mean of 201 samples taken from the clear-water wells of the Companies was only 26. These figures should reassure the consumers as to the quality of the water supplied to them.

Turning to the Lea, the statements made with respect to that river were greatly exaggerated. It is true that between the middle of June and the beginning of the present month there was a reduction in the quantity of water in store from 1170 to 1055 million gallons; but it was very soon brought up again to within a little of the first-named quantity. In order to provide the 35 gallons per head of the population which was considered adequate by Lord Balfour's Commission, the Company require about 43¾ million gallons per day. With their present reserve, they could unaided supply their district for more than three weeks. As to the wells failing, we learn on good authority that they are yielding about 3 million gallons a day more than they ever did before, and twice as much as they did a few years ago. But even supposing the stores were fast running out, and the Company required assistance, there are neighbours in a position to render it; and the Intercommunication Act of the present session sanctions this.

Whatever may be the condition of the Companies' resources just now, one very important fact has to be borne in mind—that no appeal has yet been made to consumers to restrict the use of water. In Birmingham, however, this has been done. The works in the Midland capital are deficient both in storage and means of distribution; and last Friday a circular was sent out stating that, on this account, the watering of gardens and lawns must be kept down as much as possible. Mr. Antony Lees, the Secretary of the Water Department, recently told a representative of a local paper that the Committee had been driven to take this step "in order to protect the whole community "against the thoughtlessness or the selfishness of indi-"viduals." The "aristocrat of the suburbs," who, in order to keep his lawn green, turns on his garden hose, and lets the water run for hours—perhaps all night—is the offender whom the Water Department are endeavouring to reach, for the benefit of the consumers at large.

The Spontaneous Combustion of Coal.—In the current number of the "Journal of the Society of Chemical Industry," particulars are given, from German sources, of some experiments carried out by the United States Admiralty on the spontaneous combustion of coal. It was found that the ignition of coals may be induced by condensation and absorption of the oxygen of the air by the coal, whereby the temperature is raised so high that chemical combination between the hydrogen and oxygen can take place. Another cause of ignition is the action of moisture on the sulphur of many pyritous coals, not so much from the heat of the chemical reaction as from the circumstance that the coal is split and broken up, and so fitted for the absorption of oxygen. In the case of coal stored on the land, it is mostly pyritous coal that fires. Care must be taken that the coals are stacked on iron floors, and covered; the height of the heap not exceeding 6 to 8 feet; and steam-pipes and flues being at least 20 feet away. For sea voyages, the coal should not be laden earlier than one month after it has been mined.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 188.)

In the Stock Exchange last week, things generally were in a bad way. The already existing impediments to activity and improvement in business were powerfully aided by the unexpected tightness of money. Consols were already being sold, as standing at too high a figure in view of their reduced rate of interest in 1903, and their subsequent redemption at par; and now the new depressing factor toppled them down ruthlessly. On Wednesday, they were done repeatedly at 105¾, though they became a shade better later on. The dulness and flatness affected all the other departments; and, almost without exception, prices show a more or less considerable falling off. The Bank rate (which had stood at 3 per cent. since the 2nd of February) was advanced on Thursday to 3½ per cent. This was not generally expected; but now that it is done, there is some speculation in a further advance being at hand. Business in the Gas Market was only moderate on the whole. It opened extremely brisk, and with a nice buoyant tendency. But later on the general heaviness seemed to oppress it; and it relapsed into quiet. Prices on the whole were good; and some fair advances in quotation were made, though the list is not unchequered with reductions. The chief attention was levelled at Gaslight issues; and the ordinary showed an improved feeling at the commencement of business, which led to 107 being marked two or three times on Tuesday and Wednesday. But a reaction rapidly set in; and by Friday it was down to 104—the closing mark being one point better. The secured issues were moderately dealt in at middle figures. South Metropolitan was more active, and was disposed to rise; marking as high as 139 on Friday. Commercial was in continued favour; and the old stock had another rise of two points. The Suburban and Provincial group was almost wholly neglected; but British fell back a point. The Continental Gas Companies were quiet. Imperial jumped up a point at the start; but afterwards showed no disposition to go better. None of the undertakings in the remoter parts of the world offered anything to call for notice, except that River Plate had a slight advance. Water stocks were quiet and rather drooping. East London and West Middlesex were lower, possibly in apprehension of a drought if not a famine; but Southwark preference rose.

The daily operations were: Activity marked the Gas Market on Monday, with improving prices. Imperial rose 1; but British fell 1. Business was much quieter on Tuesday; and quotations did not move. Things were not much brisker on Wednesday; but Commercial old gained 2, and River Plate ¼. Thursday was a moderate day, without any change in prices. On Friday, Gaslight ordinary was very weak, and fell 1, though other things were firm. In Water, Southwark preference rose 2. On Saturday, Gas was very quiet and unchanged. In Water, East London and West Middlesex fell 2 each.

ELECTRIC LIGHTING MEMORANDA.

Confirmation of the Competing Order for the City of London—Policy of the Corporation—Fate of the Company—Competition the Only Cure—Electrical Plant Works for England.

The confirmation of the Provisional Order granted by the Board of Trade to the Charing Cross and Strand Electric Lighting Company for a competitive supply of electricity in the City of London was almost a foregone conclusion. Yet it was not allowed by Colonel Gunter's Committee without an ample hearing of all the parties. It was a three-cornered fight, at the last, in which any two of the three petitioners might be regarded as opposing the third or odd one. The City of London Company, in possession, did not want any rivals in their domain. The City Corporation, while favouring the idea of competition in the abstract, did not approve of the particular form in which it was proposed; and the intending intruders had to make good their right of entry against trade opposition and Corporation disfavour. Counsel for the Corporation had a difficult case to sustain. It was not a matter of testimony, but of argument. The Corporation did not want their veto as the local authority to be overruled. They would not say whether they would or would not become suppliers of electricity themselves; but they strongly objected to another Company coming into the City. The Corporation were merely of opinion that if there were to be another body supplying electricity in the City, it ought to be themselves; and holding this view, they could do nothing to assist the introduction of another Company.

This is doubtless a dignified and altogether admirable position for the Corporation to take up; but unfortunately it had the defect of being outside the march of events. The Corporation had no mandate from the citizens to undertake electric lighting, and knew there was not the smallest prospect of their receiving such a commission. They did not therefore contemplate going into this business. Besides, the very first thing they would have to do in this eventuality would be to buy out the City Company. Hence there would be no competition in electricity supply at all, by this road; and the consumers would still have to bear the dead-weight of the whole concern. Whatever advantages the policy of municipalization may possess in some circumstances, therefore, it was the very worst conceivable solution of the present problem. Professing as they did that they had acted, and wished to continue to act, *bonâ fide* in the public interest, and this interest appearing to call for competition in electricity supply, the only practical course for the Corporation to follow was to let in a really competing company under such guarantees as they might be advised to impose. There was no other way of obtaining for the City that competition, technical and commercial, which Parliament and the Board of Trade have decided to be the ruling principle of efficient and economical electricity supply for the Metropolis. Parliament, represented by the Select Committee, realized this truth, and set aside the mistaken abstract plea of the Corporation, in favour of the concrete solution offered in the Confirmation Bill.

As was pointed out in our Gas Editorial Notes last week, this is a decision of the most tremendous significance for all those who have invested their money in a statutory supply undertaking, and perforce entrusted the conduct of the undertaking to a Board of Directors with practically boundless powers. The City of London Company not only had statutory privileges, but they also had contracts with the Corporation which were supposed to be even more of a charter than an Act of Parliament. The Directors were so ill-advised as to try to steal a march upon the local authority by making provision in their cable conduits for telephone wires, with the intention of charging a profit rental for the accommodation. The scheme was blown upon, and failed. Meanwhile discontent had arisen concerning the manner in which the Company was financed. As time went on, and it became apparent that the net result of the Company's proceedings was the highest price for electricity to private consumers in all London, the Corporation and the citizens agreed that the position was intolerable and must be changed. In vain did the Directors of the City Company plead their contracts—these were impugned as illegal, and denounced as impolitic. As for the Company's statutory rights, these existed by virtue of a general Act of Parliament which makes express provision for competition. The Company showed that if they were compelled to supply at the rates that were offered by the would-be competing company, their dividend would be sacrificed. Parliament was obdurate. If the Company have been extravagant of capital and unfortunate in management, so much the worse for them. Another Company with good credentials offers to supply consumers in the City with electricity at 5d. and 4d. per unit, according to consumption. The old Company aver they cannot supply at less than 6d. per unit. Does Parliament sympathize with this declaration? Not a bit. The plea that succeeds is: Shall Parliament refuse this boon of a cheaper supply to the consumers? The interest of the old Company is absolutely set at naught.

In the particular matter of the supply of electricity, the preservation of the rule of competition concurrently with the grant of statutory protection to undertakers happens to be facilitated by the accident of the existence of two different methods of supply—the continuous and the alternating systems. The Board of Trade with some artfulness pose this as a justification for allowing competition; so that consumers may have the opportunity of choosing whether they will have their electricity supplied on one system or the other. There is practically nothing in this technical ground for sanctioning competition; for if a company supplied on both systems—as indeed the City of London Company themselves are arranging to do from the beginning of next year—they would be no safer from intrusion. The case for competition rests really upon the broader ground that Parliament and the Board of Trade have no faith in any other means of keeping trading concerns up to the mark. The history of the City of London Electric Lighting Company will confirm this opinion. Here was the City—the only really good lighting area of the Metropolis reserved to one Company, and the result was dear electricity. The fashionable expedient of municipalization would not have served to cure this evil, but would only have fastened more securely upon the public the burden which the fault or misfortune of the single Company had laid upon them. Thereupon, between the two interests of the shareholders of the Company and the consumers, Parliament has not hesitated to decide for the latter. From whatever standpoint the situation is viewed, it is of a most serious and portentous aspect. If, instead of being 42 per cent. higher than that of the Charing Cross Company, the selling price of the City Company had been so much lower, would they have had to fear competition? The query is almost absurd; but it goes to make clear the real security of any trading concern.

In a recent article on "American Competition in Engineering," we referred, as had been done on previous occasions, to the anomaly and discredit of England having to import so large a proportion of its electrical plant from abroad; and we quoted Sir Benjamin Browne's opinion that "what we need, in this respect particularly, is higher and more technical education for the workmen, and more enterprise on the part of our manufacturers." This anomaly is about to be, at least partially, removed; but not by home enterprise. For, since our manufacturers appear unable to seize the opportunity created by the demand for electrical apparatus, and to supply the home markets with home-made goods, our American friends—realizing the fact that there is no very obvious reason why electrical plant cannot be manu-

factured in England as cheaply and as well as in the States, and, such being the case, that it is clear that plant turned out here would be at an advantage in competing with that imported from abroad—have determined to themselves supply plant made in England. It is announced that the British Westinghouse Electric and Manufacturing Company have acquired land, to the extent of some 100 acres, in Manchester, and are about to construct there a practical *replica* of the Pittsburg works of the American Company. The nominal capital of the Company will be a million-and-a-half; and it is estimated that they will give employment to something like 5000 men. With Mr. George Westinghouse—of air-brake and gas-engine fame—at the head of affairs, and Lord Kelvin acting as technical adviser, success seems assured to the undertaking. While the retention of orders for plant in the country is a desirable result, it is matter for regret that English enterprise and English capital have not been wholly the means of its achievement.

SIX MONTHS' EXPERIENCE WITH THE NEW WELSBACH BURNER FOR STREET LIGHTING.

THE subject of incandescent gas lighting for street illumination has been discussed up and down to such an extent that, in the judgment of some gas engineers, it has been worn perfectly threadbare. But it is not so. For instance, many economical minds at the present time are exercised as to the relative advantages to be derived from the old and new types of Welsbach burner; and there are several other details upon which gas engineers whom we could name might, did they so chose, benefit the profession by recounting their experiences. It is not our duty to mention names in this connection; but we do, and will, freely accept as part of our duty the promulgation of information, derived from experience, on this interesting topic. The object of this article is to give to our readers some practical experience in the use of the Welsbach Company's Kern burner for street lighting. We recently heard that the burner had been put into extensive use in the Putney district which is mainly within the area of the Wandsworth and Putney Gas Company; and accordingly we took steps to learn the result. By the kindly act of Mr. H. H. Jones, the Engineer of the Company, we have not only had placed at our disposal some interesting particulars, but he arranged for a night inspection of the lights. Unfortunately for our comfort, but fortunately as it enabled a fair opinion to be formed of the behaviour of the lights under conditions strongly opposing their best performance, rain fell heavily during the whole of the time that was occupied in driving round the district. We are assured there had been no special preparation for this visit; and as we found things, so they are to be described. It may as well at once be said, before venturing upon details, that the impression gained on the drive was that it would be difficult to find a more suitable light, at a corresponding cost, for ordinary street illumination. The lights, while brilliant, are not dazzling; ugly shadows are entirely absent; and there is a uniformity in the lighting of the roads which must be welcomed alike by drivers of vehicles and pedestrians. Of the numerous lamps which we saw in the long stretch of roads traversed, only one mantle was observed to be in any way defective; and even then it was doing good duty in giving a light far superior to any 5-feet batswing burner. An opportunity was also afforded of taking in part of the Wandsworth district which is still under the dominion (but only for a brief space we hope and believe) of the old-fashioned method of illumination; and the rapid change from one form of lighting to the other was almost as bad as a sudden eclipse of the moon.

On the excursion round the district, Mr. J. C. Radford, Assoc.M.Inst.C.E., the Surveyor of Putney, and Mr. P. Dodd, Assoc.M.Inst.C.E., the Surveyor of Wandsworth, joined the party; and the views of these gentlemen on the subject under inspection were decidedly interesting. A very short acquaintance of Mr. Radford, who, of course, is primarily responsible for the lighting of Putney, convinced us that where he is there will be found work carried out on the best system for securing economically the highest results for those whom it is his duty and pleasure to serve. An account of what he has succeeded in doing in the matter of lighting his district, with the co-operation of his Board and the Gas Company, is a point in proof of this conviction. It is somewhere about two-and-a half years since that he commenced a trial of the incandescent system; and he began with some of the old "C" burners, fitted with the anti-vibration frame and glass bulb. These did not altogether prove satisfactory; and, on the advent of the new Kern burner, the experiment was extended very considerably—the No. 4 size burner being adopted. Up to this time, the arrangement under which the lighting was carried out was this: The Local Authority paid the Gas Company for lighting, cleaning and extinguishing, and the estimated gas consumption, as well as 15s. per lamp per annum to the Welsbach Company for renewal of mantles and attendance to burners. Besides being found a very expensive method of proceeding, there were certain unsatisfactory inconveniences attached to working in this way. For example, the Gas Company's men and the Welsbach men might on occasion require to work at one lamp at the same time; and this, we are informed, frequently resulted in lamps being out for a night or two. On the report of the lamplighters, men might be sent by the Gas Company to clear the services of naphthalene; and if they failed to meet the Incandescent Company's men (whose presence was required to remove the burners and mantles), the afflicted lamps had to remain unlighted until restored to their normal state.

This was the condition of things which ruled in connection with the lighting of Putney at the time Mr. Jones took charge of the Wandsworth Gas Company's works. Soon after, the Putney authority approached him with the object of seeing whether the Company could not help them to put an end to the loss and inconvenience they were incurring by working on the system described. We may pass over the negotiations which ensued, and which brought about the present complete installation of incandescent lighting in the streets of Putney, and which, by the way, is, we believe, the only parish in London which can boast of being illuminated throughout on this system. The No. 4 Kern burner, with anti-vibration holder, was extensively adopted; and the whole of the parish was fitted with new lanterns —Messrs. Sugg and Co.'s "Putney-Kingston" pattern being the one chosen. The Gas Company then took over the whole of the lighting from Jan. 1 this year. To be exact with the figures, there are in the part of the district served by them 426 lamps fitted with the No. 4 burner, and 107 with the old "C" type. In addition, there are 91 lamps fitted with the latter burner in the Roehampton portion of the Parish of Putney in the Brentford Gas Company's area; so that altogether Putney can boast of 624 incandescent lamps, disposed all over the district at about 50 yards apart from point to point. Considerable trouble was experienced by the Company on first taking over the lamps, owing to the mantles being unprotected and the weather in January and February being abnormally boisterous. In fact, the Local Authority had to be charged for mantles in the first quarter on the basis of eight a year; and, of course, beyond the number actually charged, some allowance had to be made for the men getting accustomed to handling the mantles.

During the first quarter, too, the consumption of gas was arrived at; and in a very simple manner. Several trials were made in the lower and higher districts by attaching burners to a test-meter at spots selected by Mr. Radford, and lighting and extinguishing them simultaneously with the nearest street-lamps. This answered the purpose admirably; and so obviated the necessity for extensive metering. The result was that the Company and Local Authority agreed upon a consumption during the hours of lighting of 4¼ cubic feet per hour, and for the bye-pass ¼ foot per hour. This works out to a consumption, on the Company's lighting table of 4300 hours of lighting per annum, of 18,275 cubic feet per lamp, and for the bye-pass, burning 4460 hours at ¼ foot per hour, 1115 cubic feet—representing a money value, respectively, at 2s. 2d. per 1000 cubic feet, of £1 19s. 7d. and 2s. 5d., or together £2 2s. This is against a consumption, with the old 5-feet batswings burning the same number of hours, of 21,500 cubic feet, or a money saving of 4s. per lamp. While on the subject of the cost of the gas consumed, we may use these figures to illustrate a point which is frequently lost sight of; and that is, the cheaper the gas the worse is the comparison between the incandescent and the ordinary systems of lighting —in other words, the higher the price the greater the saving shown by adopting incandescent lighting. Now assuming the charge to be 3s. per 1000 cubic feet instead of 2s. 2d., the same hours and consumptions of gas as before would represent in the case of an incandescent lamp £2 18s. 2d., compared with £3 4s. 6d. in the case of an ordinary gas lamp—a saving of 6s. 4d. with gas at 3s., against 4s. 7d. with gas at 2s. 2d.

Proceeding, after this little digression, with the charges as agreed upon with Putney, a standing price was arrived at for lighting, cleaning, extinguishing, painting, and general repairs on a basis of 75 lamps per man, which, Mr. Jones finds from experience, is the greatest number that can practically be placed under one man's control, in order to secure a careful performance of duties, and lighting and extinguishing within a reasonable time. Then after the end of March, glass protectors were adopted, and this has caused such a diminution in the destruction of mantles, that last quarter the average per lamp only reached 1⅓ mantles; and Mr. Jones's impression is that, taking the year through, it will be found that an average of six per annum will not be exceeded. In the first quarter, the total cost—including the consumption of gas, the standing charge, and maintenance —worked out at the rate of £3 12s. per lamp per annum, and in the second quarter to about £3 9s.; so that, on the basis of six mantles per annum, the cost will be £3 10s. per lamp, as against £3 4s. on the ordinary system. But mark the difference! The £3 10s. represents a light of between 90 and 100 candle power; and the £3 4s. a light of 16-candle power. Of course, the figures for the incandescent lamps are based upon mantles at the present rates, which there is every hope of seeing materially reduced in the course of the next few months.

The new No. 4 type of burner is decidedly far preferable to the old "C" form for street purposes. The Putney experience supports this in three important respects: Firstly, a superior light is obtained with the same consumption of gas; secondly, no shadow is thrown by the suspending device; and, thirdly, there is the absence in the new burner of the serious liability to accident which obtained in the "C" form. In the latter as adapted for street lighting purposes, it has been found that the leather bulb decays; and, unless renewed in good time, this may result in a fire in the lantern, and the consequent destruction of the whole of the fittings and even the lantern itself.

Among other points, Mr. Jones finds it absolutely necessary to have the burners cleaned once a month, in order to secure a constant duty; and, of course, this means a certain sacrifice of mantles. A great deal of the success of the installation, too, must no doubt be attributed to the fact that new lanterns were adopted throughout the district. It is very difficult to adapt an old lantern to withstand the up and down draughts with which proper protection for the mantle cannot be secured.

In conclusion, there is one other point which we will take the opportunity of referring to. On more than one occasion, we have heard it remarked that it is a pity the Welsbach Company do not treat gas companies in connection with this question of street lighting with a little more generosity—particularly in regard to the prices charged for the mantles. The opinion is held by gas engineers that the Welsbach Company should look upon every lamp fitted with an incandescent burner as a remunerative advertisement, and in that light, if in no other, they should be able to afford a concession to gas companies in the price of the mantles. It is the cost of the mantles which causes them considerable difficulty in approaching the local authorities, especially in cases where gas is cheap. Take, for the sake of illustration, Margate, where the price is dearer than in the Wandsworth district. At Margate, incandescent lamps (owing to the saving in the consumption of the higher-priced gas) were originally supplied at the same cost as the ordinary ones; but at Wandsworth, with cheaper gas, there is the difference in the charge already shown. The point is one which may be considered by the Welsbach Company with advantage not only to themselves, but to gas companies, who are numbered among their best customers.

CHILDREN AS WAGE-EARNERS.

A VERY necessary and salutary measure—the Education of Children Bill—generally spoken of as the "Half-Timers Bill"—has now passed safely through all its stages in both Houses of Parliament, and last Thursday found its place on the statute-book. Mr. Robson, the author of the Bill, is to be congratulated upon his success in piloting the measure to the haven which is so rarely reached by craft launched upon the troubled waters of Parliament by the private member. Perhaps, indeed, the private member is not always sorry to see his ill-considered and unpractical proposals go under, without undergoing the ordeal of discussion. He is able then to talk of what he would have done if it had not been for the perversity of fate—or the other side.

The effect of Mr. Robson's Bill, now it has become an operative Act, will be to raise from eleven to twelve years the age at which children may, for the purpose of wage-earning, be exempt from attendance during half of the regular daily elementary school-hours; special provision being made whereby children in rural districts may be wholly free to work in the fields in the summer, provided they make full attendances throughout the winter until thirteen years of age. The necessity—the economic wisdom—of such a regulation has been previously referred to in these columns, and is fully demonstrated by the Vice-President of the Council on Education in an article in the July number of the "Nineteenth Century" ("School Children as Wage-Earners." By the Right Hon. Sir John Gorst, M.P.).

The theory that children's labour is absolutely essential to any of the processes of industry is now, says Sir John, being gradually given up in view of the fact that our chief Continental rivals—France, Germany, and Switzerland—have, for some time, without injuring but rather increasing their commercial efficiency, entirely excluded from their factories all workers under the age of fourteen or fifteen. The result is, of course, a higher average of education and intelligence among the young when they eventually take their place in the industrial ranks. "It is impossible for a child to do exhausting labour and learn at the same time. Half-timers who work in the morning in factories, generally spend the hours of afternoon school in slumber." For this sleeping accommodation we, of course, pay education grants. Truly we are a practical nation!

The evil of child labour is easily demonstrated; but to find an effectual remedy, particularly in respect of labour other than that in the factory or workshop, is, as for many other evils, the difficulty. "Under present social conditions, it is impossible to suppress altogether the working of school children for wages or profit. Some such employment is inevitable; and all that can be done is to attempt so to regulate it that it shall not cause the immense injury to the child which long hours of labour combined with attendance at school must cause." Mr. Robson's Bill was a tardy step in the right direction; and much more may be done by employers refusing to employ young children. They may be induced so to do by the knowledge that the experience of our trade rivals tends to prove that it pays to refuse the cheap labour of the child, which produces the inferior man. Other things being equal, the boy who stays at school till, say, fourteen years of age is more likely to eventually become the skilled foreman than the boy who is put to do odd jobs at eleven or twelve.

Sir John Gorst inclines to the granting of more power to local authorities for the drawing up and enforcing of regulations as to the employment of children, as likely to be more successful than any hard-and-fast law for the whole country. "The amount of industrial work which can be performed by a school child is best regulated and limited by its parents; and in the vast majority of cases this discretion is exercised wisely. . . . It is only a minority of the parents that require to be restrained by legislation from exacting too much from their children. . . . In this regard far more confidence can be placed in local authorities than in the wisdom of Parliament." The regulations as to children trading in the streets, recently made by the Liverpool Corporation, under a Private Act of Parliament, are instanced; and Sir John asks: "Why should not every municipal authority in the United Kingdom be invested by Public Act with similar power, and be encouraged by the Home Office to make similar regulations?"

It seems to us that it is to the Government (under which Sir John holds the office of Minister responsible to the House of Commons for the Education Department) that the question should be put, and that it is for them to supply the answer. The question of the educational efficiency of our industrial population becomes increasingly urgent; and the Government that succeeds in increasing that efficiency will do much to justify its existence.

THE NAPHTHALENE QUESTION.

WE described in our issue of Feb. 21 last (pp. 433 and 437) the researches of Dr. P. Eitner on the deposition and removal of naphthalene, and expressed approval of the method by which he had attacked the naphthalene difficulty. Dr. Eitner concluded, from the results of a large number of laborious experiments on a laboratory scale, that solvent naphtha, which consists chiefly of xylenes, would prove to be the most satisfactory agent with which to saturate gas in order to avoid naphthalene stoppages in the mains through which the gas subsequently travelled. He also stated that it would be the cheapest agent for such a purpose; but, as we pointed out at the time, in our comments on his process, he must have been under some misconception as to the price of solvent naphtha, if that really was the grade of material he intended to employ. He has now sent a note to the "Journal für Gasbeleuchtung" admitting that the price of solvent naphtha (xylene) had been wrongly given in his original paper, and that consequently his deductions as to the relative cost of this and other agents were erroneous.

Table X., on p. 439 of the number of the "JOURNAL" referred to, should, according to Dr. Eitner's corrected figures, be altered as follows: The cost of xylene there given should be trebled, becoming 1·635d. per lb., or, say, 1s. 2¼d. per gallon. Therefore, using this material, the cost of the process per 100 grains of naphthalene dissolved would be 0·201d. when the gas is cooled from 20° C. to 10° C., and 0·189d. when it is cooled from 20° C. to 0° C. The cost when xylene or solvent naphtha was used would, therefore, be greater than when either benzene or toluene was employed; but these latter materials are impracticable, because, when used in sufficient quantity to be effective, they render the gas liable to burn with a very smoky flame. Solvent naphtha, even at the enhanced price now accepted by Dr. Eitner, remains 4½ times less costly than alcohol, which is the only other material that fulfils other indispensable requirements of a suitable agent for the purpose. Dr. Eitner, therefore, still considers he was right in recommending solvent naphtha as the most rational and the cheapest practicable material for the prevention of naphthalene stoppages.

In our comments on Dr. Eitner's process, we pointed out that it rested solely on theoretical considerations, and that it might fail in practice owing to some unsuspected contingency or unrecognized fact. We looked forward with great interest to the trial of the process on a practical scale, though at the time we anticipated there would be the usual long interval between the elaboration of a technical process of this nature in the laboratory and its adoption in practice. Fortunately, however, Dr. Bunte, who had inspired Dr. Eitner's work, was able to secure an early trial of one branch of the process by the German Continental Gas Company. The apparatus, by which warm solvent naphtha can be introduced into the distributing system, has been constructed in a conveniently portable form by the Berlin-Anhalt Engineering Company. It consists of a reservoir of about 11 gallons capacity, to which is attached a hand pump with an air-chamber and pressure-gauge. The pump draws the liquid from the reservoir, and forces it through an atomizer, which is connected with it by hose, into the main. The solvent naphtha in the reservoir is heated to about 85° Fahr. by hot water which traverses tubes inserted in the reservoir. The sides of the reservoir are jacketed, to prevent loss of heat. A reel is provided for carrying the hose; and the whole apparatus is mounted on wheels for ease of transport. The rose attached to the hose is introduced in a hole in the main, at the spot where loss of pressure indicates the presence of naphthalene; and the warm naphtha is forced through the atomizer into the main. It dissolves the naphthalene; and the liquid subsequently deposited is removed at the syphons. The pressure in the air-chamber of the apparatus is from 2 to 4 atmospheres.

This apparatus only applies the less novel features of Dr. Eitner's process. It is a comparatively well-known plan to introduce some such hydrocarbon as naphtha into a main which has become blocked by naphthalene; and this apparatus appears

merely to furnish convenient means of carrying out this method with the advantage of using the naphtha in a warm and atomized condition. It aims at furnishing a cure for an existent evil; but we understood Dr. Eitner's scheme also aimed at preventing the evil arising. It is an application of this, the more important part of the process, on a practical scale that we hope we may hear of shortly.

DONKIN ON SMOKE PREVENTION.

Mr. Bryan Donkin recently presented in the columns of the "Engineer" a concise statement of the actual state of smoke prevention practice, which should be a useful guide to factory owners and others in view of the renewed activity of local authorities in respect of the suppression of the smoke nuisance. Mr. Donkin's essay is of considerable length, and we cannot find space for the whole of it; but an abstract, giving the writer's principal points, will be interesting to gas engineers, whose professional labours indirectly tend powerfully to the suppression of both industrial and domestic smoke.

Notwithstanding the growing use of gaseous fuel—a branch of the subject which is rather beyond Mr. Donkin's scheme of treatment—he holds that the discharge of smoke into the atmosphere is increasing. This is due to the increase of population, to the tendency of this population to crowd into the large towns, and to the fact of coal having become the universal fuel. A good deal of the coal burnt at home and abroad is very smoky. We are disposed to think that, as a practical question, the comparative smokiness of the coal used is one of the most important factors in this modern problem of smoke prevention. Half-a-dozen chimneys where the smokiest varieties of coal are used, for the sake of cheapness, will make more dirt in the air than scores of others where the fuel is cleaner. The dirtier coals being also usually the cheaper, this factor is unfortunately likely to increase in importance rather than to lessen with time. As Mr. Donkin remarks, "to put pressure on the owners of chimneys to burn their own black smoke, or rather not to allow them to produce it, is the difficult question which is now actively occupying the public mind." It is becoming a question also whether the pressure should not be applied at an earlier stage—that is, with regard to the character of the fuel burnt.

Upon the old query of which are the greatest offenders, factory chimneys or domestic fires, Mr. Donkin decides against the domestic hearth, on the ground that "domestic chimneys make up in quantity for the smaller amount of smoke emitted from each of them separately." He estimates that there are about one million inhabited houses in the area called London. Reckoning only two chimneys smoking from two fires (kitchen and another) in winter, we find two million chimneys smoking more or less from 7 a.m. to 11 p.m. during the six winter months, and about half-a-million in summer. The maximum of domestic smoke is given off at and about the time of lighting—say, between 7 and 9 o'clock in the morning. On a reasonable computation, the equivalent single chimney stack for all these small flues would be a shaft 1000 feet square. This suggestion recalls the old fancy of would-be sanitary reformers for collecting all household chimneys into great district stacks, from which the smoke could be discharged in a mass. It is difficult to see the advantage of this alteration. If the smoke is once made, it cannot be got rid of by any condensing or washing process known; and the larger the bulk of it that is discharged into the air at one place, the greater the nuisance. This is one very good reason why, for all its shortcomings, the domestic chimney is not, and cannot be, such a nuisance as the factory, locomotive, or steamboat chimney. The ultimate destination of all smoke is to be diffused in the atmosphere. This being so, diffusion at a multiplicity of small points is preferable to, and really more scientific than, ejection in a great mass at one time. So, to the most heedless observer, one factory, locomotive, or steamboat chimney pouring out black smoke with hearty good will, as many of them do, fills the circumambient air with reek that hundreds of household fires could not produce.

We are glad that Mr. Donkin takes due notice of a class of chimneys which possess, and exercise, peculiar powers of offending in this respect. These are the chimneys of bakeries, restaurants, and hotels, which commonly occur in the greatest plenty, and exhibit most activity, in the best residential and fashionable quarters of English towns. The City of London is full of refreshment houses, there being in 1897 no fewer than 614 establishments in the square mile of the City area where food was cooked for sale. "At a few of these places gas-stoves are used, giving no smoke; but the larger number are great offenders in this respect." The Medical Officer of Health has reported in favour of compelling this class of tradesmen to use gas fuel only; but Mr. Donkin opines that "it is difficult to draw distinctions," by which expression he seeks to imply that the small cookshops would be troublesome to catch, although their kitchen chimneys might be among the smokiest for the time during which cooking is going on. We do not see, however, why the Smoke Prevention Acts should not be amended, if necessary, in order to give local authorities more power over those shopkeepers who use fires for business purposes. The advantages of cooking by gas are so patent, moreover, that there could be no real hardship in putting pressure upon the backward cooks who still prefer smoky fires, to the general inconvenience, in order to induce them to adopt the cleanlier fuel. There will always be old-fashioned people who will cling to the means and appliances of their youth in despite of all improvements in culinary apparatus. It is possible to greatly sympathize with their steadfastness, while deploring, and endeavouring to cure, its incidental inconvenience. This consideration, however, opens up the question already mooted—of whether the prevention of smoke might not be undertaken more hopefully, in certain cases, by dealing with the character of the fuel itself. To ensure, for example, that a restaurant keeper should burn nothing but gas for cooking would be a far more drastic remedy than merely fining him whenever his kitchen chimney transgressed the law, and was caught. Similarly, if a factory owner were under engagement to burn nothing but coke or anthracite for steam raising, his chimney need not be watched. This being a free country, a great outcry would arise upon any proposal to make factory owners take out licences for industrial furnaces or chimneys to which smoke-preventing conditions could be attached; but possibly a gentle, continuing pressure within the limits of the existing law might be found effective. Mr. Donkin admits that "the use of anthracite or smokeless coal is difficult to enforce, as it is expensive and troublesome to him. Gas coke is often used in domestic grates and boiler fires, and gives no smoke." Why, then, is the latter description of fuel ever a drug in the market?

The compulsory use of coke for factory furnaces being beyond hoping for, Mr. Donkin grapples resolutely with the problem of smoke prevention in connection with the use of bituminous coal for steam-raising. Incidentally, he mentions the case of locomotives, which are perhaps greater offenders in this respect than factories, now that they generally burn bituminous coal. They used to burn coke. Why the alteration—motive of economy, or what? If the former, it is certainly an outrage that for the sake of a saving on the fuel bill a railway company should be permitted to create a nuisance at discretion. The point of economy, of course, comes early into the question. Mr. Donkin admits that "the amount of carbon escaping combustion is much too small to make the suppression of smoke on the score of economy of any practical value. It is for sanitary reasons that it should be as far as possible diminished." If all popular smoke abatement agitators had recognized this truth, their zeal in the cause might have been more fruitful of good results.

In order that prosecutions against the owners of smoky chimneys may be sustained on something like systematized proof, various means of measuring the density or the blackness of the smoke have been suggested, and tried. Mr. Donkin reviews the most hopeful of these tests; and, while acknowledging that something of the kind is essential, he finds nothing satisfactory except the smoke-scale proposed by M. Ringelmann, described in his own book on the "Heat Efficiency of Steam-Boilers." In this method, the density of the smoke is compared, by a sort of photometric observation, with the apparent greyness produced by black lines of graduated thickness, crossed on white paper. Ringelmann recognizes five shades of smoke, as in Switzerland and Germany—namely, (1) White transparent vapour; (2) light brown smoke; (3) brownish grey smoke; (4) dense smoke; (5) thick black smoke. The divisions are drawn empirically; and Ringelmann's scale is intended to facilitate the classification of any smoke by direct comparison. "These diagrams should be hung up in such a way, and at such a distance from the observer, that he can see both them and the top of the chimney under inspection at the same moment, and in the same line of sight." Mr. Donkin declares that the advantages of such a standard method of comparison are great; but it has its drawbacks also. After all, the word of the observer has to be taken; and when a reliable man has learnt the ordinary meaning of the classifications of smoke density, he can judge them by a glance, from any standpoint. There is no real need for a scale to identify black smoke when one sees it. The chief difficulty to prove is the duration of emission.

Assuming that there is no denying the fact of a chimney smoking, the next question is how to stop it. Supposing, further, that the coal is of a smoky nature, the difficulty of burning it smokelessly is great and obvious. Mr. Donkin thinks the best results are to be attained by proper regulation and division of the air supply, and by careful stoking. Heating the air before admitting it to the fire is too complicated a device. Down-draught furnaces, rather in favour in America, are open to the same objection. Powdered coal is promising; but has hardly progressed beyond the experimental stage. The Germans, whose native coal is very dirty indeed, have not made much of a hand at burning it smokelessly, for all their vaunted science. Frenchmen are in the same case. There have been German and French Smoke Abatement Commissions, which have arrived at practically the same opinions on the subject as those generally received in this country. These are, that apart from the superior solution of burning nothing but smokeless fuel, any ordinary fire-grate, if carefully stoked with fairly good coal, can be made to emit much less smoke than it generally does. It is not to the manufacturers' interest to trouble himself about the matter as regards economy of fuel, and consequently such constraint as it is expedient to put upon him must be instigated by regard for the public interest. This is the whole thing in a nutshell. Since so many local authorities in England have had factories of their own to manage, they have not been so very hard upon

manufacturers for doing what they have only too often done themselves—bought cheap steam coal, and "chanced" the effect of the chimney.

In summing up the whole question, Mr. Donkin wisely remarks on the numerous considerations that affect the desired solution of the difficulty. A marked evil is that boilers are often too small for the work of evaporation required of them, which means forced firing; and this with the generality of fuel means a smoky chimney. Stokers are not always adequately paid, or encouraged to do the best work. Moreover—and this is a highly important point—the top of the chimney is rarely visible from the stoke-hole; so that the fireman with the best intentions cannot see what he is doing. Boiler owners are oftener to blame than the stokers for the quantity of smoke made; for they buy the coal and the tools. Finally, many owners and stokers know little or nothing of the laws governing combustion. Whether they would be willing to receive instruction on the subject from County Council Instructors is another question. We rather incline to the opinion that expert assistance in enforcing the provisions of the existing law would be productive of more good. There is too much uncertainty about the actual procedure; and while this is the case, and the provision of smoke preventing appliances means outlay on which the factory owners cannot see any positive returns, the latter will continue to run the risk of prosecution rather than take any steps. Unfortunately, the first means of protection that occurs to the average factory owner is to bribe somebody to let him alone. It is only when this expedient fails that the manufacturer seriously thinks of putting his furnaces in order. Meanwhile, is it anybody's business to advise factory owners to try coke? We have heard of manufacturers with places within a gunshot of a London gas-works, who had never thought of coke as a boiler fuel. The average stoker does not know anything about coke, or if he does, it is not to the advantage of this fuel, simply because it necessitates a little more regular attention than a costly coal. A few smart fines, increasing every time, are the only means of awakening people of this sort out of their lethargy. We are of opinion that if London factories only tried what could be done with coke—with intention to succeed—there would be less of this commodity to export. Neither is the domestic consumption of coke in London anything like what it might be if there were less officialism and more business push behind the local trade.

RECENT BOOKS ON WATER SUPPLY.

THE importance given to the London Water Supply by the appointment of Lord Llandaff's Commission has led to the production of several additions to the literature of the subject; and, pending the publication of the work in which probably the greatest interest is centred—the report of the Commission—the contents of two of the books above alluded to, which have lately come to hand, may be briefly indicated.

Curiously enough, the first work to be noticed is not by a statistician or an engineer, but by a physician—Mr. Arthur Shadwell.* He does not, however, deal with the subject from the medical, but from the general, standpoint. The public, he says, are looking on all the controversy which is going on over the London Water Question with but a confused idea of its merits, and only a languid interest in it. This position he regards as pitiable, because the consumers are concerned in two ways in the issue at stake—they being at once the prize for which the combatants are fighting and the judges of the fray. Busy men have no time to follow the intricacies of such a controversy; and therefore the author has endeavoured to give the general reader a broad and comprehensive grasp of the question. The first chapters of the book are historical, and, of course, interesting. We then come to the appointment of the Commission under Lord Balfour, a sketch of whose labours is given. The author points out that, so far as the public and the Legislature were concerned, the conclusion arrived at by that Commission settled the question of the future water requirements of the Metropolis in favour of the existing sources of supply. Unfortunately, however, the troubles of the East London Company in 1895, 1896, and last year brought the water question again into prominence. The history of these difficulties is concisely given; and then the author deals with the subject of public control. He traces the steps taken by the London County Council in this direction, and shows how, at present, the consumers are "between two stools." This brings him down to recent events, which are fresh in our readers' minds. Mr. Shadwell suggests, as a solution of the water problem, amalgamation of the eight Companies, with Government control of the sources and treatment of the water. He points out that already steps have been taken which have brought some of the Companies into combination; and he thinks that amalgamation would "secure all that is really needed without creating any disturbance, exciting any hostile interests, or putting any burdens on the ratepayers." He has produced a readable book, the text of which is followed by a chronological table, an appendix containing reports and Acts of Parliament bearing upon the question, and an index.

* "The London Water Supply." By Arthur Shadwell, M.A., M.B. (Oxon.). London: Longmans, Green, and Co.; 1899.

The second work to be dealt with is of a somewhat different character, its aims being historical and legal. The original book was the joint production of Messrs. Richards and Payne—the former a Bencher of Gray's Inn, the latter a Barrister of the Middle Temple; and the second edition (now under notice) is edited by Mr. J. P. H. Soper, a Barrister of Lincoln's Inn.* The book is an attempt to present in a comprehensive form the past and present position of the water supply of the Metropolis and Greater London, as well as of some of the large centres of population in the United Kingdom. The authors simply set forth facts, and refrain from taking sides. Their work consequently follows pretty much the lines of Mr. Shadwell's book. The first four chapters carry the story down to the Duke of Richmond's Commission of 1866; and the next six continue it to that of Lord Balfour in 1892-3. The legislation of 1894-6 is dealt with; and then the question of the Welsh scheme of the London County Council and the events of the past two years are considered. These matters occupy about 200 pages of the book. The next six chapters deal with the law relating to the supply of water and the control of the Companies, the rates they may charge, and the profits they may make; and the closing chapter furnishes information as to the supply of water in provincial towns. Finally, there is a chronological table of events, followed by lists of the public and private statutes, and an index. The book is evidently the production of men who are accustomed to collecting and arranging facts and weighing evidence. Although they do not claim to have dealt with their subject exhaustively, they lay before the reader a great deal of reliable matter, and bring the London Water Question down to the second reading stage of the Companies' Bills in the present session. The book is valuable to all who wish to really seriously study the matters of which it treats, as the conditions obtaining elsewhere enable the reader to compare the Metropolis with some of the larger towns.

The works above noticed are concerned mainly with the disposal of water. It may not be out of place to refer here to one dealing with finding it.† The author calls himself an "expert water finder;" and judging by the long list of his patrons which appears early in the book, he has had a good many opportunities of exhibiting his powers. "Divining" for water has been regarded as a mysterious or "uncanny" subject; and Mr. Tompkins tells us that, curiously enough, the gift has been found to exist "principally in illiterate persons." Hence there is no elaborate treatise in existence on the subject; and the author does not profess to supply one. After showing that divining is an ancient art, he tells us how he discovered that he possessed the gift (which it appears his son, ten years of age, shares with him, though the lad's twin sister does not), and records his various engagements. The author's power of divination also extends to metals. His object in writing the book is to show and prove from his own personal observation, experience, and investigations, that this mysterious power is really "an electric force" accompanying a highly sensitive nature, and has "no more to do with the will or cleverness of the performer than if he took hold of the handles of a powerful galvanic battery." We will leave the reader to judge, after he has perused the book, how far the author has succeeded.

* "London Water Supply; being a Compendium of the History, Law, and Transactions relating to the Metropolitan Water Companies, from the Earliest Times to the Present Day." Collected and collated by H. C. Richards, Q.C., M.P., and W. H. C. Payne, L.C.C. Second edition, edited by J. P. H. Soper, B.A., LL.B. London, P. S. King and Son; 1899.

† "The Theory of Water Finding by the Divining-Rod: Its History, Method, Utility, and Practice." By B. Tompkins. Second and enlarged edition. Published by the Author at Chippenham, Wilts.

The Dangers of Electric Currents.—Our readers are doubtless aware that an exhibition of Volta relics and other interesting articles associated with the early days of electricity was recently opened at Como, the birth and burial place of the world-famed electrician. Unhappily, by an apparently accidental contact of two conductors, a fire was caused in the Marine Gallery on the morning of the 8th inst., and in less than an hour the exhibition, valued at £500,000, was utterly destroyed.

"Le Mois Scientifique et Industriel" is the title of a new publication of which we have received the first number. In certain respects, it resembles "Science Abstracts," with which some of our readers may be familiar, the contents consisting of short notices of articles on scientific and engineering subjects which have appeared in journals of various nationalities. The matter is judiciously arranged and well printed; and the new-comer should be able to make a place for itself in the ranks of French technical literature. Improvements are promised with the next issue.

Scraping a Water-Main at Plymouth.—Reference was made at the meeting of the Plymouth Town Council yesterday week to the successful accomplishment of the work of scraping the inside of the 24-inch main, alluded to in the last number of the "JOURNAL;" the length scraped was 1¼ miles, and 25 tons of corrosion were removed. The estimated cost of the work was £300; but it was done for £275. Mr. S. J. Page, the Deputy-Chairman of the Water Committee, said the effect had been to increase the flow of water by between 2 and 3 million gallons a day, and the town was saved the expense of laying a new additional main, the cost of which would have been £6000.

OBITUARY.

The death is announced of Mr. GEORGE MILLER, the late Secretary of the Wirral and West Cheshire Water Companies. He was 69 years of age.

The death occurred last Tuesday afternoon, at the age of 74, of Mr. WILLIAM ROBERTSON, one of the most prominent citizens of Dundee. He was a member of the Corporation for nine years, and became Convener of the Water Committee. In this capacity he was closely identified with the introduction of the Lintrathen water scheme.

Mr. DENNIS ADAMS, J.P., of Cambridge, passed away from sheer old age last Sunday week. The deceased gentleman, who was in his 87th year, was one of the founders of the Cambridge University and Town Gaslight Company, becoming Chairman on the death of Mr. Charles Balls, J.P., in November, 1892, and continuing in office until as recently as last year. For many years he was a Director of the Cambridge Water Company, and was one of the founders of the Trowbridge Water Company.

PERSONAL.

Sir JOHN WOLFE BARRY, K.C.B., F.R.S., has been elected Chairman of the Council of the Society of Arts for the ensuing year.

After only eighteen months' service with the Rushden and Higham Ferrers Gas Company, the Directors last April voluntarily raised the salary of Mr. THOMAS WATSON, their Engineer and Manager, £50 per annum.

Mr. JAMES LEE, the Secretary and Manager of the Wirksworth Gas Company, Limited, has secured the appointment of Manager to the Carnforth Gas and Water Company, as advertised in the "JOURNAL" for the 20th ult. He has held his present position for upwards of seven years; and his resignation has been accepted with regret.

The employees at the Longton Gas-Works on Wednesday presented the retiring Manager, Mr. W. S. M'GREGOR, whose engagement closed last week, with a silver cigar-case, suitably inscribed, as a mark of their esteem. The gift was accompanied by expressions of regret at the parting. Mr. M'Gregor, in acknowledging the presentation, said he had done his best for the men and the Gas Committee.

A few weeks ago, applications were invited in our advertisement columns, under No. 3281, for a Resident Superintendent of important gas-works. The works in question were the new ones of the Birmingham Corporation at Saltley; and we learn that Mr. CHANEY, of Beckton, has been appointed, out of about thirty applicants. Owing, however, to the approaching removal of Mr. Morrison, the present Superintendent, to Sheffield, as mentioned below, it has not yet been decided whether Mr. Chaney will succeed him in this position or take charge of the new works.

Mr. JOHN W. MORRISON, Assistant to Mr. Hack at the Saltley Gas-Works of the Birmingham Corporation, has been selected to fill the position of Engineer to the Sheffield Gas Company, rendered vacant by the resignation of Mr. Fletcher W. Stevenson. Mr. Morrison has been with Mr. Hack for about nineteen years, first as pupil, and subsequently as assistant in various departments. When Mr. Shoubridge left Birmingham to take the management of the Salford Gas-Works, Mr. Morrison succeeded him as Superintendent; and he has since continued to hold this position.

Mr. DOUGLAS F. COLSON, eldest son of Mr. Alfred Colson, who is being trained under his father at Leicester as a Gas Engineer, attained his majority last week; and on Tuesday, as expressive of the high regard for his father and himself, and with very best wishes for his future, he was presented with a handsome gold keyless watch, with monogram and suitable inscription. The presentation was made at the Town Offices, on behalf of the staff and workmen of the Gas Department, by Mr. Ernest Caillard, the Chief Cashier, an officer of over 46 years' standing, who was supported by the principal officials, superintendents, foremen, and chosen representatives of the workmen. Both Mr. Douglas and Mr. Alfred Colson spoke very feelingly in acknowledging the gift.

The annual meeting of the Society of Chemical Industry, of which a report appears in another column, is of more than ordinary interest to readers of the "JOURNAL" from the fact that the President on the occasion—Mr. GEORGE BEILBY—is personally known to some, and by name to many more of them, from his connection with the shale-oil industry of Scotland. Thirty years ago he entered the service of the Oakbank Oil Company as Assistant Chemist, and successively filled the posts of Chemist, Assistant-Manager, and Manager—holding the latter position from 1877 to 1886. While at Oakbank, he took out patents for a variety of improvements connected with the shale oil industry. In 1881, in conjunction with Mr. William Young, of Clippens, he patented an improved method of distilling shale, the special feature of which was the treatment of the material in retorts at two temperatures—first at a low red heat for the production of oil and paraffin; and afterwards at a considerably higher temperature, in the presence of excess of steam, for the recovery of the residual nitrogen as ammonia. Before the expiration of the patents in 1895, this system had been universally adopted by the shale-oil industry. The largely increased yield of ammonia obtained by the system not only added to the profits from the shales which were in common use, but was the means of bringing into profitable employment extensive fields of poorer shales, with the result that the annual output of sulphate of ammonia from this industry has risen from 6000 to 38,000 tons. Between 1873 and 1877, he worked at the conversion of sulphocyanides into prussiate of potash, and perfected a process for the purpose, which was worked on a commercial scale till the price of prussiate fell to a non-paying point through the more extensive use of aniline colours for calico printing, which to a great extent supplanted the old prussian blue. Mr. Beilby has taken a close interest in the Scottish Section of the Society of Chemical Industry since its formation in 1883, and was elected Chairman in 1897; only resigning the position a year ago in order to take up his duties as President. He holds strong views as to the necessity of a more general recognition of the intimate connection which ought to subsist between chemistry and engineering if British chemical manufacturers are to hold their own in the world's markets. He has taken every opportunity of bringing this matter before the members of the various Sections of the Society during the past year; and at the request of the London members, he delivered a lecture on "The Relations of the Society to Chemical Engineering and Industrial Research," at Burlington House, last April, the result of which is expected to be some new and practical departure by the Society.

The Treatment of Boiler Waters by Sodium Aluminate.—Messrs. C. F. Mabery and Edwin B. Baltzley have published in the "Journal of the American Chemical Society" a description of a method of treating chalky or muddy water by sodium aluminate, in order to fit it for use in steam-boilers. The subject is of general interest for power users, especially in summer time, when the lowness of natural water supplies renders it necessary to have recourse to wells which yield an inferior quality of boiler feed. Many cases of explosion and collapse of boiler tubes are traceable to this cause. Having regard to the requirements of steam-boilers in this regard, it occurred to Mr. Mabery that sodium aluminate should fufil all the purposes of a precipitant of the scale-forming constituents of a water; and this expectation has been justified by trials of the reagent. The general method includes the preparation of sodium aluminate in solution. This may be done in any suitable tank by adding sodium hydroxide in the proper amount to a solution of aluminium sulphate of known strength. The mixture is put into the water in quantity depending on its composition, thoroughly agitated, and allowed to stand for 12 to 24 hours. Numerous experiments were made with different proportions of sodium aluminate; the best results being obtained by using from one-half to the whole of the calculated proportions, depending on the composition of the water. With a very hard well-water containing much calcium sulphate and carbonate, as well as magnesium carbonate, by the addition of 85 per cent. of the calculated amount of aluminate necessary to precipitate all the lime and magnesia, nearly the whole of these constituents were removed.

The Utilization of the Gases of Blast-Furnaces and of Coke-Ovens.—Mr. E. Disdier, of Bilbao, discusses, in a paper read before the Iron and Steel Institute, the possibilities of utilizing blast-furnace and coke-oven gases. Although it was some time ago discovered that the blast-furnace is a first-rate gas-producer, and would be worth cultivating for this purpose even if it were not otherwise occupied in its primary work of making iron, progress in the useful application of this discovery has been slow. Blast-furnace gas has several drawbacks, among which are enumerated: Variable composition; low proportion of combustible; admixture of large quantities of dust, acid, and chemical vapours; and high percentage of moisture. Coke blast-furnace gases are so low in combustible constituents as to be near the limit that permits of efficient use in the gas-engine. Gas-engine makers are not afraid of this consideration; a greater difficulty being the dusty nature of blast-furnace gases. This point is being dealt with at the present time. The moisture of these gases is a secondary consideration, as compared with the drawbacks of dust and acidity. If all the difficulties could be satisfactorily overcome, every blast-furnace ought to be able to generate in this way nearly 2100-horse power for every 100 tons of iron produced daily, after making all due provision for heating the blast. If the same gases were burnt in raising steam, only 600-horse power would be obtained. The difference, 1500-horse power, is the balance in favour of gas-engines. The coke-oven, the indispensable associate and preliminary of the blast-furnace, has a further source of power at disposal. For every 100 tons of pig iron per day, between 25 and 30 retort coke-ovens are required; a ton of iron needing a ton of coke to make it. Assuming the coke to represent 71 per cent. of the coal carbonized, an addition of 600-horse power is available. Mr. Disdier sketches several different ways of realizing this economy, which is fraught with immense possibilities for cheapening both iron and power. He foresees that far-reaching changes in iron and steel-works practice will be made, when coke-ovens and blast-furnaces are placed side by side, forming one complete plant. Steam boilers and engines will be dispensed with, and all the power will be generated by gas-engines.

TECHNICAL RECORD.

SOCIETY OF CHEMICAL INDUSTRY.

Annual Meeting in Newcastle-upon-Tyne.

The Annual Meeting of the above-named Society was held in Newcastle-upon-Tyne, last week. The business portion of the meeting was transacted in the Durham College of Science, under the presidency of Mr. GEORGE BEILBY.

There was a large attendance at the opening of the proceedings on Wednesday, when the members of the Association were welcomed by the Mayor (Mr. G. Harkus), who expressed the hope that they would leave Tyneside thoroughly convinced that, whatever might be the faults of north-country people, they had warm hearts. The programme arranged for the meeting would enable the Association to judge of the great works carried on in the district—works which did not tend to improve the appearance of the landscape; but they would also have abundant opportunity of ascertaining for themselves that Newcastle was not the smoky city so often spoken of by strangers. The President, in responding, expressed the gratification of the members at the kindly manner in which his Worship had conveyed his good wishes for the enjoyment of the members and the success of the meeting. As a Society, they prided themselves on being the connecting-link between the great industries—the great commercial interests of this country—and chemistry and the sciences related to chemistry in that matter. It was gratifying to know that, in Newcastle, they appreciated that there was, and ought to be, this association, because they had in their midst a successful University College which concerned itself especially with engineering and chemistry. Newcastle had had a great past in the history of chemical industry. He believed it had also a great future; but that future would only be assured if there was the hearty co-operation between science and industry which had been attended with such marvellous success in Germany.

The Secretary (Mr. W. G. Cresswell) then announced the result of the election of officers for the ensuing year; the new President being Professor C. F. Chandler, M.D., Ph.D., of New York, and among the Vice-Presidents being Mr. G. Beilby, Mr. R. Forbes Carpenter, and Professor Frank Clowes.

The annual report of the Council was next read by the Secretary. It stated that the number of members on the register was 3312, compared with 3185 at the last annual meeting. During the year, 299 new members had been elected, compared with 311 before; they had lost 172, against 152; and there had been 24 deaths. During the past session, 89 papers had appeared in the "Journal," compared with 87 in 1897-8. The excess of revenue over expenditure amounted to £552 15s. 7d., against £737 12s. 5d., though the gross revenue was nearly £240 more. There was an increase of £350 in the "Journal" expenses, there were 1214 pages instead of 1064 as in 1897-8—a 15 per cent. increase; and the rest of the increased expenditure was divided between sectional and annual meetings. At the beginning of the present year the membership of the various Sections was as follows: London, 812; New York, 580; Manchester, 400; Scottish, 300; Liverpool, 260; Yorkshire, 200; Newcastle, 108; and Nottingham, 75. The report was adopted.

The Hon. Treasurer (Mr. S. Hall) then presented his annual statement, in the course of which it was stated that the Society's "Journal" was distributed to fifty different nationalities.

Mr. Boverton Redwood said that, in accordance with the usual procedure, the next meeting of the Society would be held in London; and, as Chairman of the London Section, it was his privilege to invite the members of the Society to assemble in that city. He remarked that 1900 would be a memorable year on account of the holding of the Exhibition in Paris, where also would be held the next Congress of Applied Chemistry; and he expressed the hope that it might be practicable, after the meeting of the Society, to pay a visit to Paris. It was unanimously resolved to meet next year in London.

The President then delivered his Inaugural Address. He dealt first with the questions of fuel and smoke, which, in view of the rapid exhaustion of British coal-fields and the serious increase of smoke pollution, he thought should be treated simultaneously. He went on to show that the total consumption of coal in the United Kingdom in 1898 was 157 million tons, of which 76 millions were consumed for the production of power for industrial purposes, 46 millions for the production of heat for industrial purposes, and 35 millions for domestic purposes. Out of the 46 millons, blast-furnaces consume from 16 to 18 million tons; steel and malleable iron works, 10 to 12 millions; other metallurgical works, 1 to 2 millions; chemical works, potteries, and glass-works, 4 to 6 millions; and gas-works, 13 millions. These figures give a general idea of the magnitude of the problem to be dealt with, and form a sound starting-point from which to consider the various remedies which have been suggested for the reckless use of coal on the one hand and the increasing pollution of the atmosphere on the other. These remedies are broadly divided into two classes: (1) Improved appliances for the combustion of raw coal, and the distribution of the air supply in furnaces; (2) The transformation of the raw coal into smokeless fuel by preliminary treatment, either by destructive distillation in gas-retorts or in coke-ovens, or by its conversion into fuel gas by partial combustion in air and steam.

The President described in general terms the process of distilling coal in retorts, blast-furnaces, and coke-ovens, and gave the amount of each of the crude products obtained from the several sources. Gas-works distil 13 million tons of coal, and produce 130,000 million cubic feet of illuminating gas, at 650 British thermal units per cubic foot, 650,000 tons of tar, 129,500 tons of sulphate of ammonia, and 7 to 8 million tons of soft coke. Blast-furnaces distil 2 million tons of coal, and produce 360,000 million cubic feet of fuel gas, at 130 British thermal units per cubic foot, 150,000 tons of tar, and 18,000 tons of sulphate of ammonia. Recovery coke-ovens distil 1¼ million tons of coal, and produce 12,500 million cubic feet of illuminating or fuel gas, at 600 British thermal units per cubic foot, 62,000 tons of tar, 900,000 tons of hard coke, and 11,000 tons of sulphate of ammonia. If beehive ovens were entirely replaced by recovery ovens, there would be a further production of 125,000 million cubic feet of illuminating or fuel gas, 620,000 tons of tar, 9 million tons of hard coke, and 110,000 tons of sulphate of ammonia. Collecting the foregoing totals together, we have the following figures (tons):—

	Tar.	Sulphate of Ammonia.
From gas-works	650,000	130,000
,, shale-oil works.	..	37,000
,, blast-furnaces	150,000	18,000
,, recovery-ovens.	62,000	11,000
Present totals	862,000	196,000
After extension of recovery-ovens	620,000	110,000
Probable totals	1,482,000	296,000

The President next considered the effects of the natural development of these industries on the markets for bye-products. He pointed out that if any material part of the 137 million tons of coal now burned in the raw condition were to be converted into gas, tar, coke, and ammonia, an altogether new condition of things would arise, which would need to be foreseen and provided for. A careful study of the whole subject has led to the conclusion that the natural outlet for the coke and pitch would be found in the manufacture of fuel briquettes; and the President advocated the turning of the very best technical skill to perfecting this manufacture. He believed that, with skill and enterprise, it would be possible to make briquettes exactly suited for every purpose from boiler firing to domestic cooking. The leading types of producer for making fuel gas were described, from the original Siemens to the most recent Mond.

Coming to the application of the various remedies, the President said it was now recognized by engineers that steam-boilers could be economically and smokelessly fired either by careful hand stoking or by the modern forms of mechanical stoker. In support of this statement, he quoted from the report of the Committee on Smoke-Preventing Appliances in 1895. He pointed out that if the boilers at present in use which are badly designed and built were gradually weeded out, and replaced by proper boilers, the burning of the 57 million tons of raw coal used for steam raising would be accomplished practically smokelessly. Where small power installations were required, it would be better and more economical, he said, to replace steam by gas or electric motors. For railways and coasting steamers, an ample supply of smokeless briquettes could be procured by the extension of the coal distillation industries.

The President went on to say that for metallurgical and chemical works of all kinds fuel gas is, in the majority of cases, the most suitable fuel, being smokeless and easily controllable. But he thought it unlikely that the average manufacturer would care to add to his capital expenditure, as well as to his anxieties, by erecting the comparatively costly plant which is necessary for the satisfactory gasification of raw coal. He thought the time was not far distant when centres for the production and distribution of fuel gas would be established in industrial districts. There was nothing to prevent the economical distribution of fuel gas to works within a mile or two of the producing station. If this were accomplished, the conditions of life in industrial localities would be enormously improved, and in time the smoke blots on the face of the country would be wiped out.

Coming to the 35 million tons of raw coal now burned for domestic purposes, the President gave a good deal of attention to the present position of domestic gas firing and its relation to heating and ventilation. He said that the *desiderata* appeared to be warmth, comfort, and ventilation equal to what is obtainable by the use of an open coal-fire, at a cost not more than twice as great. He pointed out that the gas-fire itself had been brought up to a high standard of excellence, but that it generally suffered in efficiency owing to the unsuitability of its setting and surroundings. In this matter he thought the co-operation of the architect and builder with the gas engineer was required, so that house chimneys and flues might be adapted for gas firing. For domestic heating, the fuel briquette, if properly adapted for this particular purpose, might, he said, play an important part in the displacement of raw coal and smoky combustion.

Having thus far shown the magnitude of the fuel and smoke questions in the various departments of industry, and also the various remedies which technical skill has placed at our disposal, the President concluded by inquiring briefly into the reasons why these remedies were being so slowly adopted. He suggested that the self-interest of the manufacturer, as well as his public spirit, required to be aroused. He advocated the

application by a central authority, acting under the Government, of gentle but uniform pressure upon consumers for the adoption of smokeless methods of using raw coal; and he instanced the gradual but steady improvement in the character of the emanations from chemical-works which had resulted from the judicious administration of the Alkali Acts during the past thirty years. As a means of bringing all the different interests which are concerned in this matter into line, it was suggested that the Society might arrange for holding a conference on the subject of fuel and smoke, at which the leading technical societies, as well as the actual industries concerned, should be fully represented.

Mr. David Howard (London), proposed a hearty vote of thanks to the President for his address, which, he said, justified the existence of the Society. It was for the study of such questions as those which the President had brought forward that the Society was founded; and they had never heard a most important subject treated more ably than it had been on the present occasion. The waste of fuel was simply amazing. Mr. John Pattinson (Newcastle), in seconding the motion, remarked that the manner in which Mr. Beilby had performed the duties of President, and the admirable address he had delivered, had amply confirmed the judgment of the Society in appointing him to the office. The motion was carried by acclamation, and was acknowledged by Mr. Beilby.

Other votes of thanks having been accorded, the business closed. The members were subsequently entertained at luncheon by the Reception Committee.

In the afternoon, a reception was held by the Mayor and Mayoress of Newcastle in the Leazes Park; and, notwithstanding somewhat unfavourable conditions, the function was a great success. In the evening, by invitation of Mr. F. Stirling Newall, Chairman of the Newcastle Section of the Society, a *conversazione* was held in the Natural History Society's Museum, and was attended by a large number of ladies and gentlemen.

The rest of the week was devoted to visits and excursions; arrangements being made for inspecting (among other places) the works of the Durham Coke and Bye-Products Company, where Simon-Carvès coke-ovens are in operation; the Redheugh works of the Newcastle and Gateshead Gas Company, where the Claus sulphur-recovery process is in use; and the stations of the local Electric Light Companies. The annual dinner was held on Thursday evening, at the Assembly Rooms—the President in the chair.

Visit to the Redheugh Gas-Works.

As mentioned above, one of the visits of the Society was to the Redheugh Gas-Works of the Newcastle and Gateshead Gas Company. The special features to be noticed were the mechanical charging of the retorts and the recovery of sulphur by the Claus process; but the members were, of course, more interested in the latter than in the former. Everything, however, was rendered most intelligible by the courteous and lucid explanations tendered by the Company's officials. The visitors were received by Dr. L. W. Adamson, the Deputy-Chairman, Mr. E. A. Hedley and Mr. W. R. Plummer, Directors, and Mr. Thomas Waddom, the Secretary. The officials who conducted the party over the works included Mr. W. Doig Gibb, the Engineer, and Mr. Thomas Hardie, son of the former Secretary, the Manager of the Redheugh works. It was pointed out to the visitors, who were accorded a hearty welcome by Dr. Adamson, that the Redheugh works did not form more than a part of the producing power of the Company, who have also works at Elswick and a new establishment at Walker. The Redheugh works are capable of producing 8½ million cubic feet of gas in 24 hours, while 5½ million cubic feet a day can be turned out at Elswick. Both establishments, however, will be eclipsed in time by the important works just erected at Walker, some features of which were referred to by Mr. Gibb at the last meeting of the North of England Association of Gas Managers. The St. Anthonys works, as they are termed, are intended to cope with the ever-increasing demand made upon the resources of the Company; and though at first they will not be tested to the full, their ultimate capacity will reach 15 million cubic feet per day. One of the first things shown to the visitors was the rebuilding of a large number of retorts—work which usually goes on during the summer. Very considerable interest was evinced in the mechanical stoking plant; and as both hand and machine work are in operation, at Redheugh, the visitors had an opportunity of contrasting the two. Though admitting that the stokers did their arduous work with much skill and precision, there was no question of the vast superiority of the mechanical process. A visit was paid to the engine and exhauster house, which was of special interest, as it contains the largest exhausters in the country. A department of the works in which the visitors spent some time w as the sulphate-house. The process of treating the ammoniacal liquor for the production of sulphate of ammonia was fully explained; and the extent of the Company's operations in this connection was appreciated by the party when they learnt that in 1897 as much as 2250 tons of sulphate were made. After inspecting the works, the visitors partook of luncheon by invitation of the Company. A number of toasts were proposed and duly honoured. The Directors having been thanked for the very kind reception and entertainment they had given the members, Dr. Lewkowitsch said the visit had been rendered very enjoyable by reason of the lucid explanations given by the officials of the Company; and he asked those present to drink their health. The toast was honoured, and Messrs. Gibb and Hardie briefly responded. The health of the Secretary was proposed by the Chairman (Dr. Adamson); and Mr. Waddom having acknowledged the compliment, the proceedings ended.

THE USE OF COKE-OVENS FOR THE MANUFACTURE OF ILLUMINATING GAS.

The following article, specially written for the "American Gaslight Journal" by Mr. Henry W. True, of Halifax, Nova Scotia, appeared in a recent number of that publication:—

The successful coke-oven for the manufacture of metallurgical coke, with the saving of bye-products, dates from 1862. Since that time it has been greatly improved; the object of each improvement being the quality of coke. Very few of these early ovens produced surplus gas over that required to maintain the heats; and the little saved was of poor quality, and was consumed as fuel under the boilers. At several places in France and Germany, part of the surplus gas from the coke-works was used for illuminating purposes; and in one case an attempt was made to light the town with such gas. At the present time there are many different designs of coke-ovens, all making good coke for metallurgical purposes, and having a surplus of 20 to 40 per cent. of gas over that required to maintain their heats, depending in great measure on the composition of the coal used.

In June of last year, the People's Heat and Light Company, of Halifax, Nova Scotia, after many costly experiments, commenced the manufacture of all their illuminating gas in a block of ten bye-products coke-ovens, letting down the retorts; this being, as far as we are able to discover, the first time in the history of gas-works that the bye-products oven had been used for that purpose. The ovens, which are of the horizontal tiled-flue type, are 30 feet long and 6 feet high, and have an average width of 17½ inches. They have three charging-holes on the top, and at each end a door the full size of the oven. They take a charge of 5 net tons of coal from cars running overhead. A steam ram runs on a track on one side of the ovens, by means of which the coke is discharged, falling into a car at the other side. The car has an inclined bottom, and moves slowly along as the discharged coke falls into it. This distributes the coke to an even depth; and it is quenched as it falls into the car. Very little attempt has been made at regeneration in these ovens, as in so small an installation the saving would not really warrant the extra expense. The air is preheated to a temperature of 400° Fahr., by passing through passages underneath the flue that carries the spent gases from each oven to the stack. We also get part of our steam from the spent gases passing under the boilers.

The ovens are provided with two hydraulic mains. The gas for the first eight or ten hours is collected in one of these, put through the ordinary operation of condensing, washing, purifying, &c., and distributed. The rest of the gas is collected in the second main, the tar and ammonia are removed, and the gas is used to heat the ovens. The heats maintained are about the same as with the half-depth regenerative retort-setting. The yield of coke with the same coal is from 4 to 7 per cent. greater than with retorts; that of tar and ammonia, about the same; and the yield of gas something less. The Company as yet only recover the tar and ammonia; but our experiments show that the sulphur can be recovered quite cheaply. We also experimented in a small way with the recovery of cyanogen; but, so far, we are led to believe that it would only be profitable in large works. Our coke is used in place of anthracite coal for all purposes. The tar is sold in the wells to a separate concern—operating a manufactory on the gas-works property, making roofing felts, asphalte, &c., and also creosote oil and pitch. Our ammoniacal liquor is concentrated to about 18-oz. strength, and shipped in tank cars.

From the 12th of July, 1898, to the 1st of May of the present year, we carbonized in our ovens 14,700 tons of coal, of which about 8000 tons consisted of slack of a good steam coal (half being washed), 2000 tons "run of mine" gas coal, 2000 tons of slack from gas coal, and the rest various kinds of slack, including bank slack several years old, &c. The yield of gas from the above was 129,000,000 cubic feet, of which 81,000,000, or 63·41 per cent., was consumed under the ovens, and 47,200,000, or 36·59 per cent., distributed. The average yield per ton of coal carbonized was 8775·5 cubic feet. The months of September and October gave us 42 per cent. surplus gas with gas coal; December the lowest, with only 28 per cent. surplus, principally on account of a dry steam coal, and somewhat from the fact that it requires more gas to heat the ovens in cold weather. Our ovens are roofed over, but are exposed on the sides.

The illuminating value of the above gas varied directly with the kind of coal used. With gas coal from the International Mine of the Dominion Coal Company, which is one of the best in the world, the yield would be near 10,000 cubic feet, and the illuminating power of the surplus gas 18 candles. With bank slack the yield went down to 6000 cubic feet, and the candle power of the surplus gas to 8. We separate the surplus gas for distribution. The first part is sent out through one set of mains for illuminating purposes; the second part, amounting to 36 per

cent. of that sold, being distributed through a second set of mains for fuel purposes. Unfortunately, we did not keep any accurate record of the illuminating and heating values for the whole period. The daily record for four months, however, shows the first part to average 17·64 candles, and to have a calorific value of 658 British thermal units; the second part, 11·49 candles and 592 units.

Apart from the management of the ovens, the process is the same as that of an ordinary coal-gas works. Some little care has to be used to keep uniform pressure on the ovens; and if coals high in sulphur are used, lime purification to remove the sulphur compounds will have to be resorted to, although we are having fair success in removing these compounds by washing our gas for distribution with liquor from the hydraulic main. There are no new engineering features in the bye-products coke-oven for the manufacture of illuminating gas. The problem is purely a commercial one, and consists in marketing at a profit the extra quantity of coke, tar, and ammonia.

The coke is an excellent substitute for anthracite coal for every purpose—being smokeless, much cleaner to handle, and giving intense heat. We have proved by many trials under all conditions that, ton for ton, it will go just as far. It requires some different treatment, however, and should never be sent out without an experienced man going with it to teach its use. The 24-hour coke made in an oven producing illuminating gas is not of itself strong enough to support the charge in a blast-furnace, but it greatly improves the operation of a furnace when it is mixed half-and-half with beehive coke. Smaller foundries find it excellent for their purpose. It is safe to say that a market can be made for it in any locality at $1 per ton less than anthracite coal, as some concession must be made to induce the public to try a new fuel. We have sold 75 per cent. of our coke this first year in competition with anthracite coal, with sometimes only 25c. per ton difference in price. The tar would in many instances be a drug; but if it cannot be sold, it can be burned to maintain the heats in the ovens, and worked up into briquettes with coke and breeze. There seems to be a ready sale for any amount of ammonia at a fair profit. It can also be made into sulphate at slight expense; and if situated at a distance from a market, a local market can be created for it for fertilizing purposes. The sulphur is recoverable in a pure state at small expense.

The cost of labour is low with coke-ovens. Running ten ovens to their capacity of 50 net tons of coal per day, it can be handled for 50 c. per ton, including the taking of the coal from the pocket, crushing and storing the coke, putting the purified surplus gas into the holder, the tar into the wells, and concentrating the liquor to 18 per cent. of ammonia. In the case of a coal very high in sulphur, requiring lime purification for sulphur compounds other than sulphuretted hydrogen, the cost would be increased by 2½ c. per 1000 cubic feet on a yearly make of 40 millions. This item would be about evenly divided between labour and small coke at cost, as a large part of the lime would be used many times over by a process of reburning in kilns. The initial outlay would be greater by double the cost of the purifying plant.

After running these ovens nearly a year, we see many little details that can be improved, and many ways in which much better results can be obtained. We feel that, under the circumstances, the first application of the bye-products oven for the manufacture of illuminating gas has been a success; and it seems as if there were a future for them for this purpose. The oven costs about twice as much per 1000 cubic feet of gas distributed as the half-depth regenerative retort-setting; but while the retort will last only three years, or four at the outside, the oven will run three times as long. There are ovens in use at present that have been running with but slight repairs for twelve years. While the greatest care should be exercised in bringing a block of ovens to a heat in the first instance, they can afterwards be laid off and started up without injury. We allow about two weeks to let one down; and they can be brought to a heat in 24 hours. They can be charged light or full, and can be run easily or forced. The width should be such as to coke the kind of coal they are intended to use in 24 hours, especially in a a small installation where the chargers would have other work as well as charging ovens. Five men and a foreman draw and charge two ovens per hour. On a pinch, they can be forced to burn off a charge in 18 hours, at the expense, to a certain extent, of the quality of the coke.

The great value of the coke-oven for gas manufacture is its capability of using the cheapest kinds of coal. Gas-coal slack makes good gas and fine coke. If very dirty, and the coke is intended for foundry use, the slack should be washed. Bank slack makes a coke of rather poor appearance, but good heating value. The quantity of gas would be small, and require considerable enrichment. The selection of a coal for ovens depends, of course, upon the cost of the different coals as laid down at the works and the cost of enriching. Some coals which could not be used in retorts would be excellent for coke-ovens.

A Pipe-Coupling Company.—Under the title of the Anderson (British) Pipe-Coupling Company, Limited, a Company has been formed with a capital of £25,000, in £1 shares, to acquire and work inventions connected with the coupling of pipes of all kinds by other means than those usually adopted.

REGISTER OF PATENTS.

Prepayment Gas-Meters.—Thompson, H. G., and Mower, S. E., of New Haven, U.S.A. Nos. 11,201 and 11,202; May 17, 1898.

These inventions are intended to produce "a prepayment attachment" for any ordinary type of gas-meter; and the specifications are accompanied by a series of detail drawings it is not possible to reproduce within the compass of "JOURNAL" columns.

According to the first invention, the attachment contains in itself a coin-carrier and recording mechanism, which derive their movement from the same shaft of the attachment, and which shaft in turn derives its motion from the usual shaft of the meter. The coin-carrier has co-operating with it a locking device, which enters an empty pocket, and prevents the further movement of the carrier and the further delivery of gas, when the last of a series of coins put into the pockets has been exhausted. But the locking device does not act to instantly stop the meter; the flow of gas being only temporarily reduced so as to lower the light and give warning that the last coin has been exhausted.

As a further security against any extra movement of the recording mechanism with relation to the coin-carrier, and to reduce the strain of the gearing on the main shaft when the meter is not in action, an auxiliary locking device is provided, between the main locking device and the shaft of the attachment which actuates the coin-carrier and recording mechanism. In this way, when the main locking device enters a pocket of the coin-carrier, it acts to hold the auxiliary locking device in the path of movement of a cam or projection on the shaft, and prevents its further rotation until after the main locking device has been pushed out of a pocket of the coin-carrier by an incoming coin, so as to start the meter. While so held, the strain of the teeth of the gears on the shaft exerted on the coin-carrier and the recording mechanism is relieved.

The recording device employed is preferably made up from a series of peripherally numbered discs, arranged on an axis common to all, so that the number of feet of gas used may be represented by figures arranged in a straight line.

The coin-carrier has pockets corresponding in diameter with the coin to be used to feed and start it. It is of the thickness of the coin used, and moves in a space just wide enough to receive it between the inner side of the front plate of the attachment and a dividing wall provided with a discharge opening through which the used coin is discharged into a locked receptacle between the rear side of the dividing wall and the back plate of the attachment. A discharging device acts to remove from the coin-carrier the used coin after it has started the meter mechanism. The coin-carrier is composed of a wheel (toothed at its periphery, and having a series of coin-receiving pockets) having continuous rotation imparted to it by the meter mechanism so long as the pocket of the carrier opposite the main locking device contains a coin. The coins supplied to the machine are fed into the coin-space in the front plate (one at a time) by a coin-feeder; and a coin once put into the space cannot be withdrawn, nor can a coin be put into the machine by or through the feeder with a string or wire attached.

According to the second invention, the coin-carrier employed is in the form of a segmental plate (having pockets to receive the coin from a coin-feeder), vibrated or moved to-and-fro so that it takes a coin in each direction of its movement, and carries it into position opposite a discharge opening in a dividing wall, where a discharging device, acting upon one side of the coin in the carrier, forces it from the carrier through the dividing wall and into a chamber for the used coin, located between the back plate and the dividing wall.

The coin-carrier in this case also is of a thickness exactly equal to the coin to be used; so that it is not possible to feed into the carrier a bent coin or one which will clog its motion, and so keep open the gas supply. The carrier, with its coin, is moved through a space between the front plate of the attachment and the dividing wall, and is acted upon at opposite sides by the plate and wall; and consequently a bent coin cannot get through the space. Owing to this close fit between the coin-carrier and the front plate and dividing wall, it is not possible for the coin-carrier to move if a string or wire is connected with the coin. The coin put into the feeder (it having a sliding movement outside the front plate) is, when the feeder is in one of its positions, acted upon by a suitable plunger or device, which transfers the coin from the feeder into a pocket of the coin-carrier.

Incandescent Bodies for Gas-Burners.—Duncan, J. H. H., of Coleman Street, E.C. No. 15,713; July 18, 1898.

According to this invention, incandescence bodies suitable for use with gas-burners are made by spraying over thoria (or thoria containing zirconia, or yttria, or other rare earth), in suitable shape to form an incandescence body, a solution of a suitable salt of cerium, or salts of cerium and didymium, or of cerium and neodymium, or cerium and prazeodymium, and then converting such salt into an oxide by heating so as to form an incandescence body composed of thoria with or without zirconia or yttria or other rare earth, and ceria with or without didymia, neodymia, or prazeodymia, as may be desired.

The incandescence body may be produced in any of the well-known ways; or it may be made by mixing the salts above referred to (or oxides of them) with a viscous solution of an organic substance, such as collodion, which is afterwards squirted through capillary tubes to form filaments or threads, which are then woven or knitted into mantles that are subjected to great heat for the purpose of converting the salts into oxides, and for burning out the carbonaceous matter of the once glutinous vehicle, as is also well understood.

When a mixture of thorium and zirconium or thorium and yttrium is used, thorium will usually be present in the proportion of not less than 50 per cent. by weight of the whole. A suitable solution with which to spray the incandescence body is said to be an "aqueous or alcoholic solution of the nitrate of cerium with or without the addition of a nitrate or nitrates of didymium, neodymium, or prazeodymium; the proportion of nitrate of cerium (as regards the other nitrates present) being usually not less than 50 per cent." The patentee remarks that the proportion of nitrate present in the spraying solution may vary within very considerable limits—for example, from a fraction of 1 per cent. to sufficient to produce saturation of the solvent; and the spraying

is regulated according to requirement—the suitable strength of solution being employed so as to produce a heavy or light, uniform, varying, or graduated impregnation on the exterior or interior or upon both surfaces of the mantle, or complete impregnation of the whole.

Self-Igniting Incandescent Mantles.—Buhlemann, G., of Berlin. No. 17,575; Aug. 15, 1898.

The patentee's proposals are sufficiently indicated by the title of his invention and the following summary of the claims he advances in his specification, which is not illustrated: (1) In a self-igniting incandescent mantle (having no separate igniting body, and no platinum impregnated part), the employment of platinum metal strips and of strips impregnated with incandescent material arranged alternately in the head of the mantle. (2) Combining the strip of fabric fastening or surrounding the head, from strips impregnated with platinum salts or the like without incandescent material and strips impregnated with incandescent salts; sewing the strips together; and forming the head of the mantle from this combined strip. (3) In combination with a self-igniting mantle for conducting downwards the ignition, the attachment of loosely knitted or woven igniting heddles or healds on the head of the mantle; the attachment being effected by rings or long stitches of thread. (4) The employment of oxide of cerium for conducting the ignition from the platinum metal to the incandescent mass. (5) The employment of fire-proof substances as carriers of both, as well the platinum as the oxide of cerium, for reducing the same to a finely-divided state. (6) The employment of oxides of metals forming various degrees of oxide—such as iron, silver, chromium, and the like—instead of oxide of cerium. (7) The combination of platinum metal with oxide of cerium, for effecting the initial heating, and conducting the ignition to the required point.

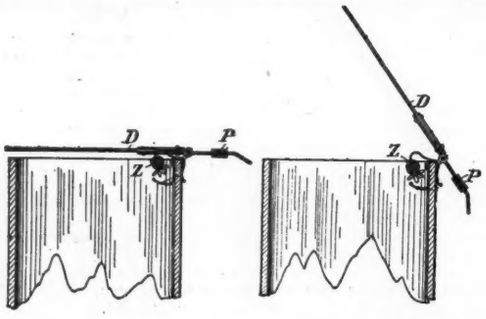
Gas-Lamps.—Talbot, H., of Old Kent Road, S.E. No. 17,753; Aug. 17, 1898.

The chief object of this invention is to provide a lamp (more especially for outdoor incandescent gas lighting, but applicable also for use indoors) which will permit, among other things, the cleaning of the glass globe without removal from the lamp, and allow a single burner to be readily replaced by two, three, or more burners, according to requirements.

Gas-Igniter.—Vietinghoff-Scheel, K. von, of Berlin. No. 19,307; Sept. 10, 1898.

Automatic gas-lighters for argand and like burners are already known in which the igniting device is arranged at the top of the chimney, underneath a plate or cap covering the latter (see patents No. 29,076 of 1896 and No. 28,709 of 1897); but in these arrangements the plate or cap is entirely closed, and the igniting device lies in a stationary mass of gas, so that ignition does not take place with certainty, because for this purpose it is preferable to have a quantity of gas flowing over the igniting pellet or device. In the present invention, the igniting pellet is arranged in a bye-pass or aperture in the plate or cap covering the cylinder, which forces the current of gas to flow directly over the igniting ball, and also diminishes the resistance of the plate on the ignition taking place, as it gives passage, to the ignited gas and so raises the plate out of reach of the flame.

On the upper part of the chimney, there is arranged a thin mica plate having in it an aperture D. The plate (on a hinge) is counterbalanced by a weight P, so that it remains standing at a short distance above the edge



of the chimney; and the igniting pellet Z is attached to a clip in such a way that it stands in the opening D. The inner arm of the clip containing it is bent upwards, so as to form a shield against the heat.

When turned on, the gas flows almost continuously in a concentrated current through the opening D over the igniting device, and is in a short time ignited. By the pressure which suddenly arises in the chimney, the mica plate is thrown up on its hinge, and (in consequence of the rise of the heated gas) is maintained during the burning of the gas in an almost vertical position; but after the tap has been turned off, the plate remains still for a few seconds in its elevated position, and then gradually descends on to its seat, so as to be again ready for use.

Regenerative Gas-Lamps.—Thomas, T. C. J., of Harlesden, and Still, W. M., of Hatton Garden, W.C. No. 27,399; Dec. 28, 1898.

This invention has reference to regenerative gas-lamps of the kind described in patent No. 22,726 of 1895; and it has for its object "to effect further improvements in such lamps, whereby the regenerative effect is increased and the efficiency of the lamp consequently improved." In the arrangement referred to, the flat-flame burner employed, or each such burner, extends outward from below the centre of the reflector, which is constructed with a central air-chamber, provided at its lower end with one or more comparatively large air-exit holes, of approximately triangular or equivalent shape, each arranged over a burner, the central air-chamber being connected to an outer annular air-supply chamber by cross-tubes arranged in the path of the hot gases flowing to the chimney.

Lighting and Extinguishing Gas.—Savelsberg, C., of Aix-la-Chapelle. No. 3884; Feb. 21, 1899.

This apparatus, for lighting and extinguishing gas, comprises a valve opened and closed by a rod provided with an extension, which is lodged on the top of one of the teeth of a toothed wheel (or in the space between two adjacent teeth), according to the movement of a ratchet-wheel connected with it and mounted on the same shaft. It is provided with double the number of teeth; and the ratchet-wheel is actuated by an electro-magnet in such a manner that, by the movement of the "anchor," when the electric circuit is closed the ratchet-wheel will be turned one tooth by means of a pawl connected to the "anchor." The lighting of the gas-jet is produced by a branch current, which becomes effective when the "anchor" is attached to the electro-magnet—the branch current passing through a thin platinum wire (which thereupon becomes incandescent) in close proximity to the burner required to be lighted. Means are provided for lifting the valve-rod, comprising a lever actuated by the "anchor" of the electro-magnet, by which the rod is held high and free of the teeth of the lifting-wheel, so as to keep the gas-valve open while the burner is intended to be alight.

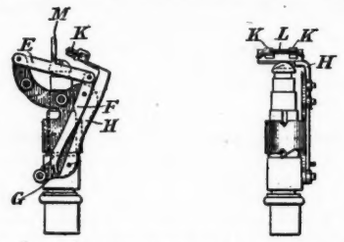
Lighting Gas-Taps from a Distance.—Schünemann, G., and Rieder, O., of Buda-Pesth. No. 5111; March 8, 1899.

This invention consists of a gas-tap moved by electricity, in connection with an apparatus which lights the escaping gas. This is effected by making use simultaneously for both purposes of the electric current which moves the gas-tap; as by attracting the armature of an electro-magnet, a lever and pawl in connection with the armature engage with a ratchet-wheel furnished with openings and capable of being moved round by the lever and pawl, and of being turned to the extent of one tooth, in front of the escape openings in the end of the gas-pipe. The fitting is made air or gas tight against the disc; so that the openings in one will coincide with those in the other, and the gas can escape, while when the current is again interrupted, and the ratchet-wheel again moved round, the escape openings will be closed. The whole of the apparatus is surrounded by an air-tight casing, from which the escaping gas passes to the burner, above which an electric spark is produced (from a central station) so as to light the gas. The action of the apparatus for lighting at a distance is based upon the well-known fact that "the rapidly vibrating armature of an induction coil closes and opens the primary circuit of such coil, whereby powerful currents are induced in the secondary circuit."

Automatic Gas-Lighter.—Birkbeck, H.; a communication from the Peerless Gas-Lighter Company, of New York. No. 7505; April 10, 1899.

This gas-lighter consists in the combination with a thermostat of a pivoted lever carrying a substance for lighting the gas, and an intermediate lever interposed between the thermostat and the lever carrying the igniting substance, and pivoted between its ends, as shown.

The parts are in these positions when the gas is not ignited. When the gas is turned on, the igniting-blocks K become incandescent, and heat the platinum L, which also becomes highly heated and ignites the escaping gas. The flame strikes the extension or arm M of the thermostat E, and heats it so as to cause it to expand lengthwise. As it



is held at its left-hand end, its right end and the upper end of the lever F are moved to the right, and the lower end of the lever is moved to the left a much greater distance—permitting the upper end of the lever H and the igniter in it to swing to the right and from the flame, under the action of its own weight, whereby the igniter is moved out of the flame. The parts remain in this position as long as the gas burns; but as soon as it is turned off (or blown out), the thermostat contracts, and the upper end of the lever F is pulled to the left and the lower end to the right, and the pointed lower end G, acting on the lower end of the lever H, moves it to the right, and thus the upper end of the lever H and the igniter are moved to the left and over the slit in the burner, to be ready so that, as soon as the escaping gas strikes the blocks K, the gas is again ignited.

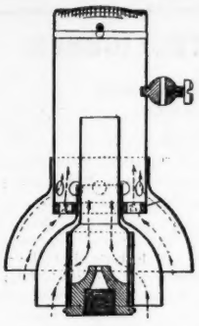
The igniting substance employed consists essentially of a block or pellet having in its composition some finely-divided platinum—which, as is well known, causes it to become incandescent when subjected to the action of hydrogen gas—and a non-combustible non-conducting material, like asbestos or clay. In forming the blocks, the two substances (in powdered form) are placed in suitable moulds, so that they can be compressed and caused to adhere to each other, and form a block having its inner end composed of a non-heat-conducting substance and its outer end of a substance which becomes incandescent when subjected to the action of the gas.

Regulating the Gas Supply to Burners.—Jones, J. & D., of Bolton No. 8336; April 20, 1899.

This so-called "invention" consists in reducing the diameter of the opening through which the gas has to pass to the burner, which may be effected, say the patentees, in various ways, as, for instance, "we may plug up the end of the supply-pipe, near the burner, and bore a small hole or holes in such plug; or we may insert a short length of fine tubing in said supply-pipe." Again, "if desirable, the desired object may be attained by diminishing the size of the elbows of the gas-pipe, or the gas-cock itself may be provided with a plug having one or more minute openings in same."

Gas-Burners.—Boulot, C., of Brussels. No. 7644; April 11, 1899.

This invention is said to relate to that description of incandescent gas-burners which are used without chimneys, and in which, in order to diminish the gas consumption, and to augment the consumption of air, the burner proper or gas-outlet is placed underneath a mixing-chamber of relatively large dimensions communicating freely with the air at a lower part of the device. These burners, the patentee asserts, suffer from the defect of an insufficient and irregular mixing of the air and gas; the flame does not yield its maximum of heat; and it has little stability. Further, they cannot, or only with difficulty, be adjusted to the variations of gas pressure; and the blue heating flame which burns above the metallic netting or perforated plate of the mixing-chamber can be beaten back or deflected by a slight air current at the gas-outlet.



The present improvements are intended to remedy these various inconveniences. They consist essentially:

First, in an arrangement of two concentric tubes, forming between them an annular space, and being in metallic contact with each other. These tubes form two distinct mixing-chambers with a double air supply; one of the chambers forming the mixing-chamber well known in all bunsen burners through which the gas passes with violence and mixes with a certain quantity of air, while in the other, which surrounds the first and terminates above the latter, the first mixture of the air and gas is still more intimately mixed with a second air-current drawn in with less force and previously heated in the space between the two tubes.

Secondly, in the arrangement of the regulating devices over the orifices through which the air enters the second mixing-chamber or outer chamber, for regulating the admission of the second air-current in correspondence with the gas pressure, and in proportion to the quantity of air that had been drawn in directly by the gas in the first mixing-chamber.

Thirdly, in the arrangement above the air-passages of two concentric bells or caps extending downwards, so as to pass below the various air-inlets; the bells intercepting, or breaking, the effect on the air-inlets of the outer currents of air (such as draughts, gusts of wind, &c.), and preventing in this way not only strong flickering of the flames, but also the beating back of the flame on to the air or gas inlets, which otherwise would result from such strong cross-current. One of the bells preferably constitutes, at the same time, the regulating device for the air-admission orifices of the second mixing-chamber.

The accompanying engraving represents a vertical section of a burner for incandescence lighting constructed according to this invention.

Automatically Cutting off and Opening the Supply of Gas to Lamps and Burners.—Frenz, W., and Sieverts, W. H. A., of Hamburg. No. 9344; May 3, 1899.

This invention relates to an arrangement for automatically cutting off and opening the gas supply in the public lamps, by the direct effect of the altered gas pressure in the day time compared with that prevailing at night—in place of the ordinary gas tap or cock.

Fig. 1.

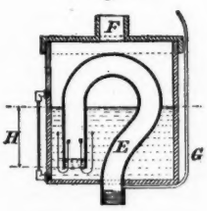


Fig. 3.

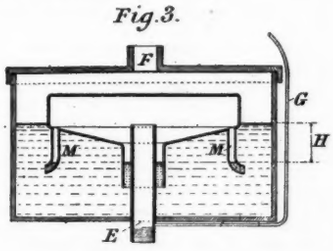


Fig. 2.

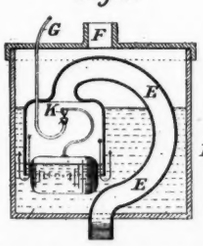
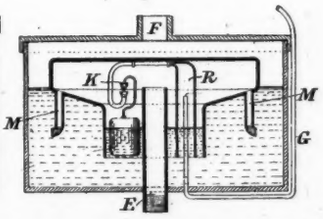


Fig. 4.



Between the gas supply and the burner is arranged a vessel charged with a liquid into which dips the end of one or more syphon tubes; or a float having two or more outlets may be used. The arrangement is such as to form a water-seal during the daytime, by which the gas supply to the burner is cut off owing to the low pressure in the main. The increased pressure towards night causes the water-seal to be destroyed; the extent of immersion of the bent tube being adjusted to suit the difference of pressures and the pressure at which it is desired to destroy the water-seal.

A simple apparatus for the purpose is shown in fig. 1, which consists of a vessel partially filled with (say) water or glycerine, and into which dips a bent supply-pipe E secured in the bottom. The cover of the vessel is provided with an outlet socket F. To the supply-pipe is connected a small tube G for the pilot-flame. The gas forces the liquid out of the pipe E; but the latter dips far enough into the liquid to ensure a small portion of the column H remaining and forming a seal for the reduced gas pressure during the day time. On the pressure increasing at night, the gas escapes, and finds its way to the burner, where it is ignited by the pilot-flame. The amount of dip of the tube E is regulated in accordance with the difference between the day and night pressures of the gas. Furthermore, by raising the pressure more or less, the jet may be regulated to burn with a full, a medium, or a reduced flame.

Fig. 2 shows a similar arrangement, but with the difference that the pipe E is enlarged at the end where it dips into the liquid, and has a float disposed therein which, under the increase of pressure, descends and forces the valve K upon its seat, so as to cut off the supply of gas from the pilot-flame, not, however, before the main burner has been lighted. The subsequent reduction of pressure in the main causes the valve of the pilot-flame to re-open before the gas is cut off in the main burner.

The liquid (water, glycerine, or the like) naturally evaporates in time; and in order to avoid too frequent replenishing, or where the difference in the day and night pressures is rather small, it is claimed to be advantageous to employ the apparatus shown in fig. 3. Here the ends of the small tubes M are fixed to a float, and are thus always at a uniform distance from the level of the liquid. The float is formed by a hollow vessel having a neck by which it is placed in an inverted position over the gas supply-pipe E, there being no replenishing required until the vessel comes to rest upon this pipe.

Fig. 4 shows an arrangement similar to fig. 3, but provided with a cut-off device, like that in fig. 2, for extinguishing the pilot-flame. The device is, however, slightly modified by having the pilot gas-pipe R formed with an enlarged portion, into which enters the continuation of the pilot-pipe, and which forms a seal for the latter. The pipe R for the pilot-flame is fastened to the main float, and thus gradually descends with the latter as the liquid evaporates.

APPLICATIONS FOR LETTERS PATENT.

13,723.—Nicolai, L. J. F., and M'Nab, A., "Production of gas, specially intended for incandescent lighting and for heating purposes." July 3.

13,728.—Singer, A. B., and Harsányi, D., "Distillation of wood and other materials." July 3.

13,748.—Glitsch, W., "Burner for incandescent lighting or heating purposes." July 3.

13,783.—Young, E. D., "Regenerators." July 4.

13,786.—Sunderland, R. H. & F., and Marshall, G., "Generating acetylene gas." July 4.

13,797.—Brewer, E. G., "Conveyors for coal and other material." A communication from the C. W. Hunt Company. July 4.

13,805.—Imray, O., "Generating acetylene gas." A communication from F. Cortez Wilson. July 4.

13,807.—Bachmeyer, A., "Supports for incandescent mantles." July 4.

13,808.—Boult, A. J., "Gas-engines." A communication from W. S. Sharpneck. July 4.

13,830.—Besemfeldee, E., "Manufacture of coal gas." July 4.

13,851.—Ludbrook, S. W., "Generator and other doors used in carburetted water-gas plant." July 5.

13,888.—Hadden, J. M., "Illuminating gas apparatus." July 5.

13,901.—Hope, G., "Acetylene lamps and generators." July 5.

13,921.—Childs, C. V., "Gas or oil motor engines." July 5.

13,924.—Lacroix, P., "Acetylene gas-generators." July 5.

13,941.—Marsh, T. G., "Gas-meters." July 6.

13,961.—Braubach, E. A., "Packing mantles used for incandescent lighting." July 6.

13,962.—Holmes, J. B., "Acetylene gas-machines." July 6.

14,000.—Apostoloff, S. B., "Producing light by the incandescence or calorescence of a metal or metallic alloy." July 6.

14,011.—Loeben, G. A., and Toboldt, A. L. A., "Pressure devices for use with burners." July 6.

14,023.—Tatham, J. E., and Cope, J. L., "Gas-burners." July 7.

14,034.—Kettmann, G., "Gas soldering burner." July 7.

14,039.—Walker, F., "Gas-generator." July 7.

14,056.—Walker, C. M., "Anti-shock attachment in connection with incandescent mantles." July 7.

14,072.—Elworthy, H. S., "Generator for acetylene gas." A communication from J. Zuberbuhler. July 7.

14,076.—Andrews, T. E., "Gas-engines." July 7.

14,086.—Snell, C. S., "Compressing gas, air, or the like." July 8.

14,098.—Ashworth, A., "Bunsen and similar gas-burners." July 8.

14,124.—Hamont, P. van, "Production of acetylene gas." July 8.

14,139—Brooks, F. H. V., "Chimneys for gas-lamps." July 8.

14,154.—Smith, M. H., "Gas or oil engines." July 8.

The London County Council and the Water Question.—At the meeting of the London County Council last Tuesday, the recommendation of the Water Committee, referred to a few weeks ago, that the Council should sanction an expenditure of £3000, in order to place them in a position to proceed with Bills dealing with the London Water Supply next session, should they so decide, was brought up. Mr. Cohen, M.P., protested against the further expenditure of public money in the promotion of these Bills. Mr. Dickinson, the Chairman of the Committee, explained that their object was to be ready to proceed with other proposals dealing with the water supply. Last year they thought Providence intervened to show that the Council's proposal for a supply from Wales was the real remedy for the present condition of things. Though last year was remarkable for its drought, this year was still more so. The River Thames had got lower than ever before; and during the next two or three weeks, unless there was an unusual fall of rain, a very serious condition of affairs would arise. The Committee were considering the matter, and would in a week or two ask the Council to take some action with regard to it. Several members opposed the recommendation; and a division was taken, with the result that the motion was carried by 82 votes to 9.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Experience with the Hydraulic Main.

Sir,—It will, I think, complete the statement of conditions under which the Livesey hydraulic has given satisfactory results with a liquor seal, if I add thereto the report of the distillers—that the tar produced is "poor in quality and deficient in benzol."

Charles C. Carpenter.

Old Kent Road, S.E., July 15, 1899.

Labour Troubles in Denmark.

Sir,—Referring to your leading article in the last number of the "Journal," the correspondent of "The Times" whom you quote has evidently got hold of "the wrong end of the stick," or is writing under inspiration of the men's party. The present deplorable state of things in Denmark has been brought about entirely by the action of the men; and when "The Times" writer states that the voice of the nation is with them, he cannot be intimately acquainted with the subject. Secondly, when he states that the Arbitration Court censured the Employers' Association for having broken the standing compact that no action should be taken by either party before referring the same to the Court, he again shows his want of the true appreciation of facts.

As you remark, the dispute began by a small strike among the Jutland joiners, and the question was referred to the Committee of the Federated Trade Union, and by them to the Committee of the Masters' Federation. These two federated bodies came to an amicable understanding; but, on the result of their deliberations being communicated to the Joiners' Trade Union, the latter refused point-blank to abide by the decision of their Federated Council. As the Council were unable to fulfil their promises to the Masters' Federation, the latter promptly locked out nearly all the joiners in Denmark; and a general lock-out soon followed in consequence, so that industrial Denmark is practically at a standstill.

This is the true state of affairs; and the "moral" which "points and adorns this tale" is that the men cannot be depended upon to keep their agreements even when these are made through their chosen representatives. Trade and industry have been flourishing in Denmark; and the men, like Jeshurun in Holy Writ, have "waxed fat and kicked." Now, this process of "waxing fat and kicking" has caused the masters much perturbation; and it is clear to everyone (who can reason) living in this country that the masters were driven to the course they have reluctantly taken. It is not a case of wages, although, goodness knows, these are high enough in all conscience for the amount of work one obtains from the men; but it is a fight as to the right of the masters to conduct their business as they may think fit, and not as the men—or, more properly speaking, the men's representatives—think. Secondly, it is to secure an assurance that the compacts entered into between the Federated Councils will be respected by the Trade Unions and their followers.

A great deal of the present state of affairs is due to an irresponsible portion of the Press, the conductors of which have much to answer for; and the political element is the hydra which will eventually choke the life out of this otherwise contented and flourishing country.

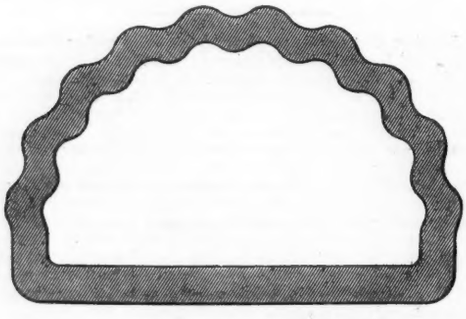
To one point I wish to bear the highest testimony, and that is to the splendid conduct of the locked-out workmen, one and all. It is a proof of their high *moral* training that there have been no excesses—not even disturbances—of any kind; and they await the ultimate decision with a complacency and dignity deserving of all praise and of a better leadership, for it is well known that the professional agitator in this country is like his *confrère* in other countries—a man who "waxes *exceedingly* fat" on the sweat of his agitatorial efforts.

F. D. Marshall.

Copenhagen, July 14, 1899.

Corrugated Retorts.

Sir,—Regarding the corrugated or undulating retort of MM. Teissier and Nègre, which is described in the last number of the "Journal," and which I am glad to note is so successful, I should like to state that in 1888 I submitted a plan of a similar retort to the late Mr. John Somerville, of the South Metropolitan Gas Company, while I was with him at the Bankside works of that Company. Mr. Somerville thought the idea a good one; but he was afraid that when the retort was put to work the corrugations would fill up with carbon. On receiving that opinion from such an authority, I did not go further with the matter at that time. In the following year I removed to Sheffield, and in 1891 gave Mr. Fletcher W. Stevenson, the Engineer to the Company, a tracing of the retort. As he was of the same opinion as Mr. Somerville, I did not get the retort, of which I send a drawing, put to a practical test.



I mention the above facts to show that, although MM. Teissier and Nègre have secured a patent for corrugated or undulating retorts, they were not first in the field with the idea. I notice that their retort is corrugated on the bottom; but I fear the advantages of this arrangement will be outweighed by its disadvantages.

Alexander Allan.

Gas-Works, Neepsend, Sheffield, July 13, 1899.

PARLIAMENTARY INTELLIGENCE.

Gleanings from the Committee Rooms.

It is a pity that some such rule as the "closure," which has been found a wholesome means of dealing with obstruction in the House of Commons, could not be applied, when occasion required, to the proceedings before Parliamentary Committees on Private Bills, in order to produce good sense and moderation. The very existence of some such instrument, even if not applied, might have had a grand effect in the saving line in the case of the Lea Bridge Gas Bill. The time of the members of the Committee might have been saved; and it follows that the ratepayers of Walthamstow and Leyton would have had a smaller bill to pay. The work of the Committee would have been accelerated; and consequently those interested in the Yeadon and Guiseley Gas Bill would have also lost less time and money. Not content with the preposterous amount of time they wasted the preceding week over petty points, the Authorities opposing the Lea Bridge Bill continued to the end in the fatuous course they adopted from the beginning. It will be remembered that the sitting of the Committee ended last Friday week with the declaration of the Chairman (Sir William Houldsworth) that the preamble of the Bill was proved; and thus there only remained the consideration of the clauses, which absorbed, by the unreasonable action of the opponents, about another day-and-a-half.

A report of what took place during this day-and-a-half appears elsewhere; but let us here see, in briefer form, what the opponents gained by their lavishness, and how little the Company were injured. The Company fully proved the necessity for the new powers sought; and they successfully resisted the purchase clause which the Local Authorities put at the head and front of their case with the flimsiest of backings. The promoters also obtained the whole of the capital applied for—viz., £187,500, with power to manufacture on new land and to purchase further land. On the other hand, they conceded a rise in the illuminating power from 14 to 15 candles; but the Committee increased this to 15½ candles. Fractional increases of this kind are to be deprecated. But the Authorities aimed at 16 candles; and the Committee adopted the old-fashioned course of "splitting the difference." The Company also gave way on the question of the insertion of the purity clauses. Then the District Councils obtained a testing-station away from the gas-works; but there is little doubt the Company would willingly have granted this but for the opposition on other points. The Authorities were, however, defeated in their desire to insert the West Ham clause limiting the "carry forward" each half year to an amount equal to 1d. per 1000 cubic feet of gas sold; but the Committee fixed £6000 as the limit of the amount of divisible profits to be carried forward. No complaint can be made regarding this, as it is amply sufficient to prevent fluctuations in the selling price and the dividend, which fluctuations might have occurred had the proposal of the opponents found favour in the eyes of the Committee. The Company were further successful in resisting the insertion of a clause, similar to one in the West Ham Act, regarding applications to Quarter Sessions for the appointment of Auditors. Thus the net result is that the Company practically obtained all they asked for; and the District Councils secured an extra ¼ candle. As Mr. Baggallay facetiously put it: "Was the game worth the *half* candle?" That is a question the ratepayers and their governing representatives may possibly ponder over when they are faced by the bill of costs, which they have recklessly run up by sheer immoderateness. No one will dispute their right to make an effort to secure advantages for their constituents; but every reasonable person must condemn insensate extravagance in the steps taken with that object. Even the points on which the Authorities were to an extent successful, are questionable benefits, seeing that the increased costs which they will involve in the manufacture of gas will delay the time when reductions in price can be made. Thus the consumers will suffer; and the consumers are members of the ratepaying community, whose interests the District Councils are elected to serve and promote.

At the close of the proceedings on the Lea Bridge Bill, that of the Yeadon and Guiseley Company was taken in hand by the same Committee. Practically the only object of the Bill was to apply the sliding scale to the undertaking, or, in other words, to rectify an omission which occurred when the Company were last in Parliament. On that occasion, when the Bill was being drafted, it was found that, by inadvertence, no notice of the intention to adopt the sliding scale was given; and consequently, as further powers were urgently required, they had to proceed without the clauses. Had it not been for this oversight, they would have stood a good chance then of obtaining an initial price of 5s. The present was considered an opportune time to bring themselves in accord with present-day legislation in this respect; and so they promoted a Bill for the purpose, and asked for an initial price of 3s. 6d., which, considering what might have been and other circumstances, was not unreasonable. But Yeadon, Guiseley, and the Rawdon District Councils opposed; and the House of Lords Committee, before whom the Bill first came, lowered the proposed initial price to 3s. In its amended form, the Bill came before Sir William Houldsworth and his colleagues. The strengthening on this occasion of the promoters' legal representation by the addition of Mr. Balfour Browne, Q.C., and the substitution of Mr. Wedderburn, Q.C., for Mr. Morton Smith on the side of the opponents, was an indication that a severe effort was going to be made to overthrow the Bill; and so it proved. The promoters on their part endeavoured to convince the Committee that 3s. did not allow sufficient margin to meet liabilities on the loan and additional capital and the increased cost of coal and other materials. The opponents, however, sought the rejection of the Bill, or the further reduction of the initial price to the low point of 2s. 9d.—the net selling price at the present time being 2s. 8½d. per 1000 cubic feet of 14-candle gas, which, considering the size of the concern, and placing it in comparison with even larger and more

influential undertakings, testifies to excellent management. In order to allure the Committee to adopt the first-named course, the opposing Counsel brandished before them some rather indefinitely-worded resolutions of the District Councils about applying to Parliament for powers of purchase. But the Committee were not to be wheedled in this way. Without hearing the Company's Counsel in reply, they declared the preamble of the Bill proved, but raised the illuminating power of the gas to 15 candles. The Company will be able to satisfy this requirement without affecting their present dividend; but whether the consumers will find themselves out of pocket by it is another matter. Altogether the opposition to the Bill can only be regarded as an attack on the sliding scale, which Parliament has for years accepted as an instrument that operates beneficently on behalf of gas consumers. The expert evidence for the Company was furnished by Mr. Henry Woodall and Mr. Thomas Newbigging; while Mr. E. H. Stevenson supported the case of the Local Authorities. A report of the proceedings will be published next week.

HOUSE OF LORDS.

The following further progress has been made with Bills:—

Bill read a second time and committed: Warrington Corporation Bill.

Bills reported, with amendments: Manchester Corporation (General Powers) Bill, Redditch Gas Bill, Stockport Corporation Bill, Walker and Wallsend Union (Electric Lighting) Bill.

Bills read the third time and passed: Ayr Burgh Bill, Birmingham Corporation Bill, Goole Urban District Council Bill, Woking Water and Gas Bill.

Bills Royal Assented: Airdrie and Coatbridge Water Bill, Barton-on-Sea Water Bill, Belfast Water Bill, Bury Corporation Bill, Bury Corporation Water Bill, Church Stretton Water Bill, Cobham Gas Bill, Dundee Gas, &c., Bill, Fishguard Water and Gas Bill, Gainsborough Urban District Council (Gas) Bill, Hastings and St. Leonards Gas Bill, Lanarkshire (Middle Ward District) Water Bill, Local Government Provisional Orders (Gas) Bill, Mid-Kent Gas Bill, Nottingham Corporation Bill, Rhondda Urban District Council Bill, St. Neots Water Bill, Scunthorpe Urban District Gas and Water Bill, Shotley Bridge and Consett District Gas Bill, Skipton Urban District Gas Bill, Shirebrook and District Gas Bill, Stretford Gas Bill, West Middlesex Water Bill, Wishaw Water Bill, Wetherby District Water Bill.

HOUSE OF COMMONS.

The following further progress has been made with Bills:—

Lords Bill read a second time: Workington Corporation Bill.

Lords Bills read a second time and committed: Fylde Water Board Bill, Gas Orders Confirmation Bill (No. 1), Gas and Water Orders Confirmation Bill, Wolverhampton Corporation Bill.

Lords Bills reported, with amendments: Lea Bridge District Gas Bill, Loughborough Corporation Bill, Water Orders Confirmation Bill, Whitehaven Corporation Bill, Yeadon and Guiseley Gas Bill.

Lords Bills read the third time and passed: Glasgow Corporation (Gas and Water) Bill, Lowestoft Water and Gas Bill, Totland Water Bill.

HOUSE OF COMMONS COMMITTEE.

Monday, July 10.

(*Before Sir* W. Houldsworth, *Chairman*, *Mr.* D. A. Thomas, *Mr.* Lucas Shadwell, *and Mr.* Wentworth Beaumont.)

LEA BRIDGE DISTRICT GAS BILL.

This Bill came before the above-named Committee to-day for the consideration of clauses.

Mr. Littler, Q.C., Mr. Claude Baggallay, Q.C., and Mr. A. V. Frere appeared for the promoters; Mr. Pembroke Stephens, Q.C., and Mr. Hutchinson, for the Walthamstow Urban District Council; and Mr. Pembroke Stephens, Q.C., and Mr. Courthope Munroe, for the Urban District Council of Leyton.

Unopposed clauses having been gone through, and an amendment passed by the Committee, Mr. Baggallay submitted a clause embodying the conditions which the promoters were prepared to accept as to the future standard of purity, illuminating power, and pressure. Counsel described the clause as being exactly the same as that put into the Crystal Palace Gas Act four years after the clause which the petitioners now asked for had been put into the West Ham Act. The Crystal Palace clause, however, fixed the sulphur at 20 grains, and gave a margin for fluctuation. He pointed out that one of the petitioners had admitted that the allowance of a margin was reasonable.

After some conversation between Counsel and experts on either side, a provision was agreed to as follows, as a rider to clause 37 of the Bill:—

(*b*) From and after the first day of January, 1901, the gas supplied by the Company shall be wholly free from sulphuretted hydrogen, and shall not contain more than 4 grains of ammonia or more than 20 grains of sulphur in any 100 cubic feet of gas. (*c*) No forfeiture shall be incurred in any case with respect to which it is proved before the Justices that the defect of illuminating power, or insufficiency of pressure, or excess of impurity, was occasioned by unavoidable cause or accident, and, in the case of an excess of sulphur, unless that excess shall amount to 2 grains upon the average of six consecutive days, or ten grains upon any one day. (*d*) In the event of the gas examiner finding any defect of illuminating power or purity or deficiency of pressure in the case of gas, he shall forthwith give notice thereof to the Company at their works.

Mr. Pembroke Stephens argued that the candle power should be raised from 15 to 16. As the Company were to continue to supply in the district, they should be put under the same obligation to supply 16-candle power gas as their three neighbours, the West Ham, The Gaslight and Coke, and the Commercial Gas Companies, who supplied all the district to the south and south-east of the Lea Bridge Company's area.

Mr. Baggallay said the Companies mentioned by his learned friend were, owing to their magnitude, not at all comparable with the Lea Bridge Gas Company. He pointed out that the West Ham Company's district had the advantage of large docks, railway works, and other industrial concerns, while the Lea Bridge area was an almost entirely working-class residential district. A rise of candle power from 15 to 16 meant an increase in the cost of production of 2d. per 1000 cubic feet. This would be a serious matter, because it would prevent the Company reducing the price, while giving no advantage in the illuminating power. Mr. Livesey, the Chairman of the South Metropolitan Company, only the other day, before Sir James Rankin's Committee, had said that it was the burner which really controlled the illuminating power of the gas, and that with an improved Welsbach burner it was possible to get an illuminating power of 150 candles from 14-candle gas. In the same way, if the burner was bad it was impossible to get a good light from high-quality gas.

The Chairman said the Committee could not consider the question of burners as very important. Occupants of artisans' dwellings could scarcely be expected to buy Welsbach burners.

Mr. Baggallay said he wished to show that for cooking and heating—the purposes for which the gas would be largely used in the artisans' dwellings—a low-power gas was better than a high-power one.

Mr. H. E. Jones and Mr. Cash were re-called to give evidence against the raising of the illuminating power above 15 candles. The former said that gas of 14 and 15 candle power was almost universal in the Midlands and South of England, away from cannel-coal fields; and that it was not possible, on a practical scale, to get more than about 15-candle gas from ordinary Newcastle coal. In his view, the whole future of gas depended on an extension of its use for power and trading purposes, besides cooking and heating. The consumer would want a cheap fuel, rather than a gas of a high illuminating power. He thought that the South Metropolitan Company would in time be coming to Parliament for a reduction from 16 to 15 candles. There were four or five other burners besides the Welsbach which would give a high illuminating power from a low standard gas.

At the conclusion of Mr. Cash's evidence and cross-examination, the Committee decided that the gas should be 15½-candle power.

Mr. Pembroke Stephens then asked for a clause providing that the testing station should be away from the works, at the Town Hall, Walthamstow; and Mr. E. H. Stevenson was re-called in support of the clause.

Mr. Leo Taylor, the Gas Examiner to several District Councils, including those of Walthamstow and Leyton, was also examined, and said that he had found at the Lea Bridge works that the quality of the gas had varied during the time he was actually taking tests. He thought, from a purely sentimental point of view, that the consumers would be more satisfied that the gas supplied to them was the same as that tested, if the testing station was away from the works. The fluctuations observed during the testing suggested the possibility of manipulation by those responsible for the conduct of the works. Witness was examined as to the necessity of giving the officials of the Company notice of when it was proposed to take the tests; and he said two hours would be quite sufficient. He, however, thought that no notice should be given of a test as to pressure, as it could be altered in five minutes at the works.

Witness was severely cross-examined by Mr. Baggallay as to the meaning of his suggestion that the gas might be "manipulated" while the tests were being taken by the Gas Examiner; and at last, after some fencing with the question, witness said that although the gas had varied while he had been in the works, he would not say that it had been manipulated within the present Manager's time. Generally, unless he observed something unusual with regard to the gas, his tests would not take more than half-an-hour. He admitted that, though he had taken tests at the works of the Company for the last nine years, he had never made any inquiry as to the way the gas got round the works to the testing-place, and that he did not know it took an hour.

Counsel for the promoters contended that, whereas the officials of the Company had, of course, the opportunity of being present at tests made at the works, the establishment of the testing-station outside would cause considerable inconvenience to the officials if they attended. If they did not attend, the tests could be made in their absence; and this would be unfair.

Mr. H. E. Jones, re-called, said there was no necessity for a testing-station outside the works, as the character of the gas would not change between the works and a testing-station a mile-and-a-half away.

After some discussion, the Committee decided to insert the clause proposed by the petitioners, as follows:—

The Company shall, at their own expense, before the 1st of January, 1900, provide at the Town Hall, Orford Road, Walthamstow, a testing-place, and shall provide and fix therein all the necessary appliances and machinery for testing the purity, illuminating power, and pressure of the gas supplied by the Company in accordance with the provisions of this Act; and such testing-place shall be deemed to be the testing-place required to be provided in conformity with the provisions of the Gas-Works Clauses Act, 1871.

Mr. Claude Baggallay then asked to abandon the existing station. Mr. Hutchinson agreed; and the Committee consented to the proposal. Mr. Baggallay proceeded to argue the question of notice before the tests were taken. He said that if the clause were left as it was, the Company would be required to keep a man always at the Town Hall, or to allow the tests to be taken in their absence.

The Chairman said the clause followed the form adopted in the Crystal Palace Act, and declined to alter it.

Mr. Courthope Munro then brought up a clause as to the mode of testing. The clause he proposed was the same as that in the West Ham Act, and was as follows:—

The apparatus to be used for testing the gas and the mode of making the tests (except that the testings for illuminating power shall be made at intervals of not less than half-an-hour each) shall be such as shall from time to time be prescribed by the Referees for testing the gas supplied in the Metropolis. Such apparatus shall be from time to time provided by the Company at their own expense.

Mr. Leo Taylor was examined in support of the clause, and Mr. Jones against it; and Mr. Frere addressed the Committee in opposition.

The Chairman said the Committee had decided to put in the clause.

The proceedings were then adjourned till Thursday.

Thursday, July 13.

On the consideration of clauses being resumed this morning, Mr. Courthope Munroe proposed a new clause dealing with the time of testing, on the lines of a similar provision already in the West Ham Act, and reading as follows:—

Any gas examiner may test the purity and pressure of the gas supplied by the Company at any time of the day or night, and the illuminating power between the hours of 5 o'clock and 11 o'clock in the afternoon.

Whereas, he said, the Local Authorities had now power to test for illuminating purposes between 5 and 10 p.m. in the winter, and 8 and 10 p.m. in the summer, the proposed clause would allow them to test between 5 and 11 p.m. all the year round. The new purity test, being a 24-hour test, could not be done in the times allowed by the present section.

Mr. Frere, for the promoters, while prepared to concede the clause so far as it affected purity and pressure, resisted its application to the question of the illuminating power. There had been absolutely no evidence to show why the Committee should depart from the ordinary provisions of the Gas-Works Clauses Act, 1871. He submitted that it would be a very bad precedent to make alterations in the general law unless some strong grievance were shown to exist. It was only reasonable that the test, for illuminating power should be taken at the time when the gas was being actually used for illuminating purposes. The West Ham clause was the only case in which a Committee of Parliament had overridden the general law on this matter.

The Chairman said that, although the West Ham clause had been the only precedent cited, the Committee were disposed to follow that provision, and to put in the clause, as West Ham was bound up to a great extent with the Lea Bridge district.

Mr. Pembroke Stephens then proposed a clause providing that, if the clear profits of the Company in any half year were more than sufficient to provide for the insurance fund and pay the authorized dividends, the excess should be carried to the credit of the divisible profits for the next half year; provided that whenever such excess shall exceed the sum necessary to allow of a reduction of 1d. per 1000 cubic feet of gas sold in the preceding half year, and for the increased dividend which the Company would be entitled to pay, the Company shall reduce the price to be charged for gas in the next half year by 1d. per 1000 cubic feet. He said the object of the clause was to prevent the accumulation of unappropriated balances in the books of the Company after the extra dividend and the reduction in price had been provided for, and which under the Gas-Works Clauses Acts would have been applicable to a reduction in the price of gas.

Mr. E. H. Stevenson, re-called, gave evidence bearing out the explanation of Counsel as to the object of the clause, and said he did not see how the clause could damage the Company at all. The only way of preventing the piling up of profits was by a special clause limiting the carrying-over.

In cross-examination by Mr. Frere, witness stated that after the technical reserve fund and the insurance fund had been provided for, it was often found that companies carried very large sums forward, even though it appeared that they were interested in putting down the price of gas and so securing an extra dividend. The clause would practically enforce the carrying out of the sliding-scale in its entirety. Witness was cross-examined to show that such a provision would cause constant variations in the price. As a general rule, a reduction of price increased the consumption, and with it the profits. On their own evidence as to anticipated consumption, the Company would in the future have between £1500 and £2000 to carry forward.

In reply to the Chairman, witness said, although it was true that in the West Ham case—the only precedent put before the Committee—the price of gas had remained stationary ever since the clause was put in, whereas all the other Companies round London had been making reductions, the clause had nothing to do with cause and effect.

Re-examined by Mr. Courthope Munroe, witness said the standard price in West Ham was 3s. per 1000 cubic feet, as against the 4s. 6d. of the Lea Bridge Company.

Mr. Joseph Cash and Mr. H. E. Jones were re-called, and gave evidence to show that the clause was unnecessary, and, together with a consequent clause giving the Local Authority or any two consumers the right to apply to a Court of Quarter Sessions for a reduction of price, would lead to endless litigation. The Company were the best possible judges as to whether a reduction could safely be made.

Mr. Frere addressed the Committee against the proposed clause; but he suggested that, if they decided to put in a clause at all, they should adopt the one put into the Crystal Palace Act, limiting the amount which could be carried forward in any one year.

Mr. Courthope Munroe urged that the Committee should not limit the amount for all time, but leave it open, as in the West Ham case, to be discussed before a Court if the parties could not agree. He pointed out that the case all through had been that the district was quite abnormal, and one which was rapidly growing.

The Committee decided to insert a clause similar to that in the Crystal Palace Act, limiting the amount which the Company could carry forward in any one year to £6000.

Unopposed clauses having been dealt with, the Bill was ordered to be reported to the House as amended.

A Correction.—In the course of the cross-examination of Mr. Joseph Cash upon his evidence on the Lea Bridge Gas Bill, as reported in last week's issue, there was a slight confusion on the part of the reporter between West Kent and West Ham, with the result that Mr. Cash was made to say that "the West Ham Gas Company had practically starved their works." At this point Mr. Cash's comparisons were being made entirely with the West Kent Company.

The Lighting of New York City.—At the present time, according to a report drawn up by the Department of Public Buildings, Lighting, and Supplies, Greater New York has 25,054 public gas-lamps, 1415 naphtha-lamps, 387 Welsbachs, and 4324 electric arc lamps. The number of electric lights in the entire city on Dec. 31 last was 809,896, of which all but 21,801 were incandescent lamps.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Tuesday, July 11.

(*Before Mr. Justice* BUCKNILL, *without a Jury.*)

Crays Gas Company v. Bromley Gas Consumers Company—A Question of Boundary.

The hearing of this case was resumed to-day.

Mr. LITTLER, Q.C., Mr. BRAY, Q.C., and Mr. CLARKE WILLIAMS appeared for the plaintiffs; Mr. CRIPPS, Q.C., M.P., Mr. DANCKWERTS, and Mr. VAUGHAN WILLIAMS represented the defendants.

His LORDSHIP remarked that he had read the evidence through the previous evening.

Mr. CRIPPS said he had now to sum up the case for the defendants, as he had not had an opportunity of doing so before. The history of the case began in 1864, because in November of that year both Companies were sending out notices that they were going to apply to Parliament for powers to supply gas in identical districts—namely, Chislehurst, Farnborough, and Orpington. The question here was only as regarded Farnborough. Considerable negotiations then took place, as it was perfectly natural that the two Companies should, if possible, come to an arrangement between themselves. The case for the Crays Gas Company, as put forward by their Chairman, Mr. May, was that an agreement in writing signed by him for the Crays Company and by Mr. Robinson Latter on behalf of the Bromley Company, was made before the Act was passed. He put the date at April 22 or April 25 in 1865. In order to succeed, plaintiffs had got to prove two things—firstly, that an agreement in writing of some kind was made, as provided by section 48 of the Bromley Gas Company's Act; and, secondly, they had got to show that the work defendants were carrying out in the Farnborough district, in reference to which the injunction which plaintiffs asked for would apply, was within the boundary reserved under the terms of such agreement (if any) to the Crays Company. The defendants' answer to the case was that, as far as they knew, there never was any such agreement in writing at all. There might have been some understanding between the parties; and Mr. May might be convinced there was such an agreement, after such a long lapse of time. But though he might *bonâ fide* believe there was such a written agreement, yet, as a matter of fact, no such arrangement in writing need ever have been made. Mr. Robinson Latter, with whom the agreement was said to have been made, was dead; and defendants had not the slightest trace of it in their minutes. Undoubtedly, this was a serious question; and though it might be true that Mr. May and Mr. Latter had authority to sign what would have been in the nature of a compromise before the Parliamentary Committee, it was certainly most extraordinary, if this was done at that stage, that there was no completed agreement under seal made between the Companies. Plaintiffs did not suggest it, because it was inconceivable, if there was such an agreement, that it could have been carried out without the knowledge of the other Directors, and that no minute was made of it; and he did not believe they had ever suggested there was any agreement under seal. What they said was that in April, 1865, there was some agreement signed, and that it determined the boundaries as far as the point in issue was concerned. All the evidence the defendants could put forward was negative evidence—evidence that they had never heard of such a thing, and could find no trace of it. They believed there was some arrangement about Chislehurst; but they entirely denied there was any agreement as to Farnborough. He should suggest that all the subsequent history and negotiations, looked at as a whole, showed two things: First, that Mr. May was mistaken when he said there was an agreement in writing made in 1865; and, secondly, that having regard to the different way the agreement had been put at various times by Mr. May himself and the other representatives of the Crays Company, there was no sufficiently trustworthy evidence from which his Lordship could infer an agreement in the terms put forward by the plaintiff Company. It was alleged to have been made in 1865, when there was no question of supplying gas in the Farnborough district. Plaintiffs' case depended on whether Mr. May's recollection—having regard to the subsequent correspondence—was sufficiently certain to satisfy his Lordship that he could be depended on, and that he had an accurate remembrance of the terms of the alleged agreement of 1865, and which, as far as they knew, no one had ever seen since. The evidence was conflicting as to the district which was discussed. Defendants said it was Chislehurst; and that as Farnborough was of no importance to them at that time for the purpose of gas supply, it was never discussed. In 1884, the boundary question came up again; and the correspondence at that period was of great importance, from his point of view, because when the final dispute arose it was said defendants were stopped from going into the Farnborough district owing to the arrangement made in 1884, whereas if the boundary question had been settled in 1865 the negotiations in 1884 could have had no real place at all, and were inconsistent with any settlement having been arrived at in 1865.

His LORDSHIP said he understood the plaintiffs put it that the arrangement in 1884 was a revival of the agreement of 1865, and was an honourable understanding come to on the loss of the 1865 agreement.

Mr. CRIPPS contended that this was not consistent with their letters; and he went through the correspondence at length, and quoted passages which he submitted supported his view. He said if there was any agreement in 1865, it was a purely verbal one, and only related to Chislehurst; and that everything that had occurred since was inconsistent with Mr. May's statement of a written agreement in that year.

His LORDSHIP asked how, supposing there was an honourable verbal arrangement made between Mr. May and Mr. Latter defining the boundaries of either of the Companies, that affected their legal position?

Mr. CRIPPS replied it would not affect them at all, because section 118 of the Act clearly specified that any such arrangement must be in writing. Therefore the plaintiffs could not succeed on anything but a written agreement.

The further hearing was eventually adjourned to a day to be fixed, in August.

The Assessment of the Leominster Gas-Works.

An unsuccessful appeal has just been made by the Leominster Gas Company against the assessment of their works. The original rateable value was £175; and this was raised to £472. Mr. Thomas Newbigging had examined the Company's accounts, and come to the conclusion that £293 was a fair amount. In arriving at this total, he had allowed for an advance of 1s. 6d. per ton in the price of coal, and also for an increase in the price of coke. He had taken 25 per cent. of the returns from residuals, and deducted it from the tenant's capital, upon which he allowed 17½ per cent. He had left out the profits on fittings and on a weighing-machine, as they were liable to drop out at any time; and he considered that only the profit realized by making gas would be taken into account by a tenant. He had put down the stock of coals at 335 tons, and the meters at cost price. For the Assessment Committee, it was contended that £472 was a fair assessment; that no allowance should be made for an expected rise in the price of coal; and that it was wrong to value the meters at their cost. Objection was taken to the stock of coal put down by Mr. Newbigging, as being excessive; and also to his 17½ per cent. on the tenant's capital, for a like reason—it being urged that money was now very cheap. The Bench dismissed the appeal; but no order was made as to costs.

In re the Ottoman Gas Company, Limited.

In the Chancery Division of the High Court of Justice last Wednesday, Mr. Justice Wright had before him a petition presented by the Ottoman Gas Company, Limited, under the Memorandum of Association Act, 1890, for leave to alter the Memorandum of Association. Mr. Levett, Q.C., said the undertaking was not registered under the Companies Acts, but under the Joint-Stock Companies Act. There were reasons why no advertisements of the petition had been issued, and the Registrar wished him to mention the matter to the Court. His Lordship said he had read the petition, and it seemed all in order. He asked if the learned Counsel had an affidavit that there were no English creditors. Mr. Levett replied that such an affidavit had been filed. The alterations proposed were right, and came within the Act. The Company were going on under the same name. His Lordship acceded to the prayer of the petition.

Winding Up of the Loanda Gas Company, Limited.

Last Wednesday, a petition presented by Messrs. Newton, Carnegie, and Co., Limited, for the winding up of the above-named Company came before Mr. Justice Wright, in the Chancery Division of the High Court of Justice. Mr. Stokes, for the petitioners, said his clients were creditors of the Company. The petition had been ordered to stand over for a month, in order to allow of the Company being reorganized; and it was hoped, if further time were given, that this would be carried through. The Company had gone into voluntary liquidation during the adjournment. Mr. Hart, for the Company, said when the petition was previously before the Court he undertook that the Company should not be wound up voluntarily; but since then the petitioners had consented to this being done. The Company was in Africa, and the Directors in Paris. He asked that the petition might stand over generally, or until the first petition-day in Hilary sittings. Mr. Stokes said he did not object, as his clients wished, if possible, to help the Company. His Lordship ordered the petition to stand over till the Hilary sittings in 1900.

The Consumption of Water in Crewe.—At last Wednesday's meeting of the Crewe Town Council, the Chairman of the Water Committee complained of the great increase in the consumption of water through the adoption of the water carriage system. He said that the Health Committee ought be charged £12,000 a year on this account, as in seven years the increase in the water consumption had grown from 82 million gallons a year to 140 millions, and of this quantity at least 32 millions were accounted for by the system of water carriage.

Bury St. Edmunds Public Lighting.—At Tuesday's meeting of the Bury Town Council, it was announced that as from Aug. 1 next, owing to the greatly increased price of coal, and the higher cost of production, the Directors of the Gas Company will find it necessary to raise the price of gas for public lighting from 2s. 3d. to 2s. 6d. per 1000 cubic feet. Thereupon, after some discussion, it was resolved: "That having regard to the decision of the Gas Company to increase the price of gas for public lighting, the question be referred to the Electric Lighting Committee to consider the advisability of laying the matter before the Local Government Board, with a view to their sanctioning the original electric lighting scheme in the borough."

Incandescent Gas v. Electric Lighting in Douglas.—At last Wednesday's meeting of the Douglas (Isle of Man) Town Council, a return was moved for of orders given for the establishment of all electrical installations since the introduction of the Welsbach incandescent lighting of the public streets in 1893. It was urged that the return should be granted in the interests of the ratepayers, seeing that the incandescent gas system was the predominant one on the Continent so far as street illumination was concerned. The motion was strongly opposed on the ground that, as the Council had already adopted a scheme of electric lighting, further discussion was waste of time; and it was eventually rejected by the casting-vote of the Mayor.

The Disposal of Gas Profits at Middleton.—At the last meeting of the Middleton Town Council, Alderman Walker, in moving the adoption of the minutes of the Gas Committee, said the Committee had resolved that the balance of profit, after placing one-half to the sinking fund for the redemption of loans and annuities as provided by the Act, should be applied in paying off the amounts outstanding with respect to works which had been pulled down to make room for the new retorts, &c. They had now wiped off the whole of the debt incurred by the erection of a new retort-house, and the new plant was working very satisfactorily. It was pleasing to be able to state that the cost of the erection of the new plant would not have to be added to capital account.

MISCELLANEOUS NEWS.

THIS YEAR'S EXAMINATIONS IN GAS MANUFACTURE.

The Pass List.

We have received from Sir Philip Magnus, the Superintendent of Technological Examinations at the City and Guilds of London Institute, the following lists of the successful candidates at the last examinations in "Gas Manufacture" conducted by the Institute, the question papers for which were given in the "JOURNAL" for May 2 (p. 1133).

HONOURS GRADE.

First Class.

Madden, H. D. Williams, H. R. S.

Second Class.

Astbury, E.	Carpenter, A. A.	Halliwell, S. E.	Mitchell, H. V.
Bagshaw, A. H.	Comeley, A. N. T.	Hislop, L. R.	Silcox, R. B.
Bedford, C.	Cranfield, W.	Jennings, G. L.	Thomas, J. M.
Bennett, W. H.	Dougall, A.	Johns, W. H.	Urquhart, J.
Branson, A. W.	Gales, P. F.	Mackay, J. W.	Wilson, W.

ORDINARY GRADE.

First Class.

Ball, A. F.	Edwards, A.	Hoggard, A. W.	Reece, T. H.
Broughton, J. T.	Folkes, T. D.	Loveridge, C.	Smith, W. J.
Dixon, J. E.	Goodenough, F. W.	Mason, A.	Stevenson, G.
Drewett, F.	Gregory, A.	Nelson, R.	Thompson, A. M.
Drewett, P.	Herring, E. C.	Pearson, D. U. R.	Winslow, D. J.

Second Class.

Adcock, J. H.	Chandler, D.	Jowett, T.	Reid, N.
Anderson, H. L.	Cooke, P. W.	Lane, A. G.	Ross, W. M'L.
Ardley, R. P.	Dauzelman, W. A.	Lee, J. W.	Ruggles, H. G.
Barber, L. G.	Duff, J. R.	Lloyd, G. H.	Scarth, P. F.
Benn, E.	Farquhar, W. B.	Mead, A.	Shadbolt, W.
Black, T.	Garlick, R. H.	Mottram, A. E.	Stiven, D .D.
Bowden, R.	Green, W.	Old, B. G.	Walker, F. J.
Bull, G.	Hartley, J.	Oldfield, F.	Webb, R. N.
Burgess, H.	Heapman, L.	Page, W. T.	Young, W. E.
Burton, W. A.	Holton, A. L.	Reed, W. H.	

METROPOLIS GAS SUPPLY.

Dr. A. W. Williamson's Quarterly Report.

The following is an extract from the report of Dr. A. W. Williamson, F.R.S., the Chief Gas Examiner for the Metropolis, on the quality of the gas supplied to London during the quarter ended the 30th ult.

I.—*Illuminating Power.* The average illuminating power in standard sperm candles at each of the testing-places was as follows:—

The Gaslight and Coke Company—	
Fenchurch Street, E.C.	16·6
Kinghorn Street, Cloth Fair, E.C.	16·8
Dorset Buildings, E.C.	16·4
Millbank Street, S.W.	16·7
Vincent Terrace, N.	16·3
Carlyle Square, Chelsea	16·2
Camden Street, N.W.	16·4
Graham Road, Dalston	16·8
Kingsland Road, E.	16·7
Spring Gardens, Charing Cross	16·4
Vinery Villas, St. John's Wood	16·2
Lambeth Road, S.E.	16·3
Hornsey Road, N.	16·4
George Street, Hampstead	16·7
Commercial Gas Company—	
Wellclose Square, E.	16·8
Parnell Road, Old Ford	16·4
South Metropolitan Gas Company—	
Hill Street, Peckham	16·9
Bedford Road, Clapham	16·4
Lewisham Road, S.E.	16·4
Blackfriars Road, S.E.	16·5
Burrage Road, S.E.	16·5

It will be seen from these results that the average illuminating power of the gas made by the three Companies was higher than the parliamentary standard at all the testing-stations.

II.—*Purity.* Sulphuretted hydrogen was not reported to have been present in the gas at any of the stations during the quarter. The average amount of sulphur present in the gas in other forms than this was considerably less at all the stations than the quantity permitted. Excess of sulphur was reported to have been present during the quarter at the Vincent Terrace, Kingsland Road, Vinery Villas, George Street, Bedford Road, and Blackfriars Road stations. Ammonia was generally present in the gas throughout the quarter, but only in slight quantities. The limit allowed was not exceeded on any occasion.

THE DISASTROUS EXPLOSION AT THE HONLEY GAS-WORKS

Coroner's Investigation.

The Adjourned Inquiry into the circumstances attending the death of the four men who were killed by an explosion of gas while engaged in dismantling an old gasholder at the works of the Honley Gas Company was resumed yesterday week by the Coroner for the district (Mr. W. Barstow). The names of deceased men were: Thomas Egerton (21), single, of Elland; John Makin (27), single, of Elland; Benjamin Pearson (36), married, of Milnsbridge; and Joe Binns (27), married, of Greetland. Mr. H. A. Child represented the Contractors for the work, Messrs. R. Dempster and Sons, Limited, and the Honley Gas Company. Mr. R. Welsh attended in the interests of Pearson's widow, Mr. J. L. Garsed

of the relatives of Carter and Makin, and Mr. A. Bastide of the relatives of Binns. Mr. A. F. J. Dunolly, H.M. Assistant Inspector of Factories, was also present. At the opening of the inquiry on the preceding Thursday, Mr. Child expressed, on behalf of his clients, their profound regret at the terribly sad accident. Evidence of identification was taken; and it was ascertained, at the request of a Juror, that Pearson and Binns were smokers, Makin was not, and Carter was not known by his father to smoke.

Mr. John Baldwin, Secretary and Manager of the Honley Gas Company, was the first witness called yesterday week. He stated that the Company recently decided to have the holder replaced by one of telescopic pattern. The work was entrusted to Messrs. R. Dempster and Sons, of Elland. The task of getting the gas out of the holder was commenced at noon on the Saturday preceding the accident, and on the following Monday forenoon, when the deceased men arrived, the holder was almost empty. On Monday the officials of the works had let the holder slowly down into the tank; and the same evening the foreman of the works took a 1¼-inch plug out of the top of the holder, with the object of letting out the remaining gas. Next morning the manhole lid was removed, in his presence; the object being to release any gas that might have been left in.

Questioned by Mr. Garsed, witness said they did not remove the manhole lid on the Monday evening because they did not want any lights or people smoking about the premises. If the manhole lid had been off for three or four days he did not think any accident would have occurred, but in view of what had happened, he did not think that if it had been opened at the same time as the plug (on Monday night) all the dangerous element could have escaped. The Company did not possess a gas leakage indicator; but from what he heard, these instruments were not always reliable. He admitted he took no steps to ascertain whether the leaking mixture was dangerous or not. If proper time had been allowed for the gas to escape, he did not think there would have been an explosion.

In answer to Mr. Child, Mr. Baldwin said the means taken to release the gas were such as were invariably adopted to secure that end. He had no idea there was gas in the holder at the time Messrs. Dempster's men commenced work. If there was (this in reply to Mr. Garsed), it was Dempster's men's look-out; not the Company's.

Examined by Mr. Dunolly, witness said he did not know it was the practice to let a holder stand for a couple of weeks empty of water and with all the manholes open before cutting operations were commenced. He thought it would be a fair time to allow three or four days for the gas to escape; but in the present instance the manhole was only open a few hours.

Replying to the Coroner, witness expressed the opinion that a spark from a cutting tool used by one of the men caused the explosion.

The next witness was Tom Whiteley, foreman at the gas-works. Asked whether there was any reason why he should not have taken off the manhole lid on the Monday night, witness said they did not want to be too hasty. He thought the plug had better let a little gas off before the manhole was removed. Mr. Baldwin and himself inspected the holder on the morning of the accident. They put their noses to the plug-hole, and afterwards their heads into the manhole. They both felt satisfied there was no gas at the time.

John William Banks, foreman plater for Messrs. Dempster and Sons, said he commenced cutting the holder at 2.30 on Tuesday; and he then set Makin and Ben Taylor to the same work. They used the ordinary cutting tools. Carter and Binns were at the side, shifting weights, while Pearson was helping the plumber to put down apparatus for pumping the water out. Shortly afterwards he heard the explosion, and, rushing to the place, found the holder upside down. None of his men helped to get the gas out of the holder; indeed, he thought all the gas was out at the time. The cutting tools were of steel. It was a common thing for sparks to fly when iron and steel came together in violent contact. He could find no fault with the way in which the men used their tools. Neither witness nor the men under him knew anything about the properties of gas.

The contract between Messrs. Dempster and Sons and the Company for carrying out of the work was produced. It stated that the Company would empty the tank, and make all necessary alterations to it.

It was pointed out to witness that the Gas Company were pumping the water out at the time of the occurrence; and he was asked why he did not wait until they had finished. He replied that they thought it was safe; the plug having been out all night. He found a clay tobacco pipe on the edge of the tank after the explosion; but he had never seen any of the men smoking while at work.

The Coroner, in summing up the evidence, thought that the Jury would come to the conclusion that it was the Company's duty to see that the gas had escaped, and not Messrs. Dempster's. Assuming this to be so, the point for the Jury to consider was whether Mr. Baldwin and his men did everything that was proper and sufficient to ensure the escape of all the gas. There was nothing that they could call criminal negligence; for there was no substantial amount of negligence. The cause of the explosion had not been proved; but it had been stated that there could not have been one except from fire. They could not return any other verdict than "Accidental death;" and they might add an opinion or rider, expressing their views as to what had been omitted in the arrangements for letting off the gas.

The Jury, after a private conference, handed in the following unanimous verdict: "We find that the deceased men accidentally met their deaths owing to the unexhausted gas in the holder exploding; the gas being, in our opinion, ignited by a spark from the workmen's tools. We also think that proper precautions should have been taken to ascertain that the gas had been exhausted from the holder before allowing the men to commence work upon it."

In the course of an interview with a pressman, Mr. Gibson, of Messrs. R. Dempster and Sons, stated that the explosion lifted the holder completely up in the air, and in descending one side caught the edge of the tank, so that the holder was at an angle of 45°. There was no loud report. The gas simply blew itself out and puffed. It was something like an elastic ball collapsing, and the men seemed to spring away. They were not killed by the explosion, but by the terrible fall; for they were blown to a great height. Pearson fell on the roof of the offices, Carter fell on the coal shed, and Makin dropped on to the spiral staircase of the scrubber. It was a shocking sight. The firm had had many similar jobs in hand, and everything had turned out right.

Mr. Robert Porter, the Engineer of the Elland Gas-Works, likewise interviewed, said it was remarkable how the holder was lifted up into the air. It was not a tear-away sort of explosion, a general "bust-up," but an expansion of the gases, which forced the holder straight up into the air, somewhat like the action of the piston-rod of a perpendicular gas-engine. If there had been a little more "play," the holder would have dropped back again into the tank little the worse. Instead of this, the holder caught one side of the tank in its descent and toppled over. Mr. Porter considers that the men must have been thrown a great height before they fell, and pointed out, in proof of his statement, that it was not a ripping-up sort of explosion, and that masons working within two or three yards escaped without a scratch. The mixture in the crown of the holder was probably as highly explosive as it could be.

RUSHDEN AND HIGHAM FERRERS GAS COMPANY.

The First Ordinary General Meeting of the Company since its incorporation was held at Rushden on Monday last week—Mr. Paul Cave in the chair.

The Secretary (Mr. G. S. Mason) read the notice convening the meeting, and also the report of the Directors. In the latter it was stated that the net profits for the year ending March 31 amounted to £2509, against £1915 for the preceding twelve months. The make of gas had risen from 41,912,000 to 53,893,000 cubic feet—an increase of 28 per cent.; the quantity sold, from 38,923,000 to 48,494,353 cubic feet, or 27 per cent. more, realizing £7733 against £6518. The sales of residual products had gone up from £1061 to £1555; and the profits on the fittings account were £23 more. The sales of residuals include an item of £216 for sulphate of ammonia, on which a profit of £90 had been realized. The expenditure in respect of repairs and maintenance of works, mains, and services amounted to £792. Contracts had been entered into for a new holder, to cost £7350; and it was expected to be ready early next year. Owing to the increase in the price of coal, the contracts this year were from 1s. 6d. to 2s. per ton in excess of those of last year, which would cost the Company about £475. It had been decided to reduce the price of gas by 1d. per 1000 cubic feet as from the 1st of April, which would cost £235. The value of coke had increased in nearly the same proportion as that of coal; and the Directors had confidence that the additional revenue from this source and from sulphate of ammonia, together with the larger sales of gas, would quite balance the items for additional expenditure and reduction in price. Referring to the rapid rise in the sale of gas, the Directors pointed out that for the year ending March, 1898, the total revenue from prepayment meters was £257 15s. 6d.; while for the past financial year it amounted to £804 12s. 3d. On the first-mentioned date the Company had out 184 of these meters, and 594 on March 31 last. They were largely used in connection with cooking-stoves, the number of which had risen from 62 in 1898 to 375 in 1899. The Directors recommended a dividend of 10 per cent. on the paid-up capital, free of income-tax.

The Chairman remarked that the report was a very satisfactory one; and he moved its adoption and the declaration of the dividend recommended.

Mr. E. B. Randall seconded the motion, and it was at once carried unanimously.

Under the Company's Act, obtained last year, all the Directors retired; but they were unanimously re-elected. Messrs. W. H. Wilkins and C. L. Bradfield were appointed Auditors.

This concluded the business.

It may be mentioned, with reference to the new holder now in course of erection, that it is in two lifts, each 30 feet high, and 102 feet and 100 feet respectively in diameter, and that the plans and specifications for it were prepared by the Company's Engineer and Manager (Mr. Thomas Watson).

NEW SUNLIGHT INCANDESCENT COMPANY, LIMITED.

The Statutory General Meeting of this Company was held last Tuesday, at Winchester House, E.C.—Mr. J. H. Duncan in the chair.

The Chairman stated that the Directors met the shareholders under very different conditions from those which prevailed six months ago, and they were already under circumstances which they might characterize as the presage of dawn. The reconstruction scheme had gone through satisfactorily. Out of £150,000 of the old capital, £126,000 had been taken up by old shareholders, and £24,000 by new ones. A settlement had been applied for, and was expected to be granted shortly. They had now completed the purchase of the white mantle patents from Germany, and in connection with this had allotted a number of fully-paid shares, which increased their issued capital; and he thought the sum originally stated by the Board (of from £180,000 to £185,000) would be the ultimate figure at which the capital would stand. A matter which had been occupying a good deal of public attention lately was the victory which the Company had gained recently in the Appeal Court. Of the seven cases they had fought with the Welsbach Company, they had won five, one had been abandoned, and one lost; but this had since been gained in the Court of Appeal. It was well known that the master patent of the Welsbach Company would expire at the end of the present year. When this occurred, their real sheet-anchor would be the 1893 patent. The latter, not being a master patent, was upon a distinctly lower level—always assuming that it could stand the test for validity. Their adversaries knew very well that they were going to be on a lower level after the end of this year. When they brought out the Kern burner, it was exactly this point that they made so much of. They acknowledged that they were going to lose their position under the chemical master patent, but said they were going to retrieve it under the burner patent, because this burner was going to give them 25 candles per cubic foot of gas, against 15 candles that other people could get. The Welsbach Company very properly pointed out that this

would make such a difference to people who used the mantle that they would never dream of going to anyone else. If the De Mare patent, which was held by the Sunlight Company, controlled the Kern burner, it would be seen what a great difference it made. It was simply turning the tables. It was not the Welsbach Company who were going to control the market, but the Sunlight Company. This was the real kernel of all the flutter there had been over the recent decision in the Court of Appeal. The De Mare actually controlled the Kern patent. They would be told by the partisans of the Welsbach Company that it did not; but he would pledge himself that it did. Counsel had examined the matter very carefully on their behalf, and had given an emphatic opinion upon it. The German Patent Office always examined these matters when a patent was submitted to them; and when the Kern burner came before them they immediately asked: "What about the De Mare?" An even more emphatic corroboration of his view was the fact that Kern himself had expressed an opinion that it was necessary for him to have the patent to protect his own. Further, the Kern and Welsbach people together had bought up the De Mare patents in every other country in the world; and they would not have done so unless they had thought it necessary to have them. Lastly, the shareholders knew what a flutter there had been in the Welsbach camp during the last few days. When he last addressed them, he said they had reserved equal rights under that patent, and they would be able in any case to share the advantages of the high-power burner. But now he was able to say they would control it, and make it the master patent in the market hereafter. They were told unofficially by the opposite side that they were going to appeal to the House of Lords. He was very glad of it, because it showed the importance they attached to it. With regard to the white mantle, their opponents had at last delivered their statement of claim, and had taken the first step to go on with their action. He considered that the Sunlight Company had the control of the vital burner question, though it would take some time to effect their control. But he thought they had this control embodied in their patents, and they also claimed to have a full right to share with the Welsbach Company the business in the white mantle. He went on to say that the trade they were doing was very large, and from the figures which had been taken out for the past month he found it was just about three times what it was for the corresponding period of last year. The staff were prepared for a large increase as soon as the season opened, and for this trade they would be very well equipped. In conclusion, he moved a resolution making a call of 2s. per share on the 16s. paid shares of the Company.

Mr. F. Walker seconded the motion, which, after some discussion, was carried unanimously.

THE CHEAPEST GAS IN THE WORLD.

Widnes Breaks Its Own Record.

Special interest attaches to the proceedings at the Meeting of the Widnes Town Council last Tuesday, owing to a proposal being carried to further reduce by 1d. per 1000 cubic feet the present low price of gas. The reduction will come into force on Oct. 1 next; and the charge within the borough will then be 1s. 3d. per 1000 cubic feet to consumers of 3 million cubic feet per annum and upwards, and 1s. 5d. to consumers below that quantity.

Alderman H. S. Timmis, the Chairman of the Gas and Water Committee, in moving that their proceedings be ratified, drew attention to the following tenders for coal which it was proposed to accept: Abram Coal Company, Limited, 3000 tons; Garswood Hall Colliery Company, Limited, 4000 tons; Sutton Heath and Lea Green Colliery Company, Limited, 5000 tons; Messrs. W. and J. Richardson, 1000 tons; Simpson Davies and Sons, 2000 tons. These tenders, he said, amounted to an advance in the prices of coal of about 30 per cent. Notwithstanding this advance, however, he had also to submit for confirmation two paragraphs of the minutes reading thus: "Special meeting, June 20. Statement of profit and loss account for the past year showing net profit on gas account (after providing the sum of £1579 4s. 10d. as and for the cost of public lighting) £3499 5s. 8d., and net profit on water account £1295 12s. 3d., submitted and considered. Resolved—That as and from the 1st October next, the price of gas to all ordinary consumers be reduced by 1d. per 1000 cubic feet, and that the quantity of gas supplied by prepayment meters be increased from 36 feet to 38 feet per 1d." Looking, he said, at the advanced price they were paying for coal, it must strike members of the Council as rather astonishing that, co-incident with this advance in coal, the Committee came with a recommendation to reduce the price of gas to all classes of consumers. It would, however, be remembered that last year such a reduction was made, and the results had proved most gratifying, having far exceeded anything the Committee anticipated, so that they found themselves at the end of the year faced with a much larger surplus than estimated, and also with a larger consumption, and a consequently larger reduction in the standing charges of the undertaking. After going very carefully into the facts, and setting against the increased price of coals the increased prices that were being obtained for residuals, the estimated profit at the end of the next twelve months was such that the Committee felt warranted in giving the gas consumers the benefit of a further reduction. He might as well say that when this fresh reduction was proposed he at first said, "No, I could never agree to it; it would not be business-like in the face of such a heavy increase in the price of coal." He could not think of further reducing the price of gas when Widnes was already selling gas at a much less price than that charged anywhere else. He saw no object in breaking their own record and in their making another record, when no one was asking for a reduction, and no one would contemplate a reduction. He at first thought it would be slightly foolish to reduce the price under such circumstances. But on carefully considering the figures, and the profits anticipated, he began to think differently, and was eventually able to agree to the proposed reduction which the Finance Committee had loyally supported. The reduction in the price of gas last year had borne fruit; and he believed the like action would bear fruit again in the future. Consequently, on the part of the Committee, he brought forward this recommendation. It was the economical management of the Gas and Water Manager (Mr. Isaac Carr) which had enabled the Committee to propose this. He (the speaker) did not believe there would be a single gas undertaking in the country that was copying Widnes in thus reducing the price of gas unasked; other concerns were rather raising the price of gas because of the increased price of coal, and looking for additional profit. At Widnes the enhanced profit arising from the sulphate of ammonia plant was largely owing to the use of a patent superheater invented by their own Engineer; and taking this profit on sulphate, together with the increased prices of coke and tar, the Committee expected, despite the enhanced cost of coal, to show a profit largely in excess of the record profit presented in this year's balance-sheet.

Mr. G. Davies, Vice-Chairman of the Committee, seconded the motion, though he was rather of opinion that it would have been wiser to have reserved the reduction for a year, in face of the current commercial movements, and until the course of the markets was further ascertained. He believed that such an advance in the price of coal had not been experienced in summer for the last 20 years. Still, he supported the majority of the Committee, perceiving they had the justification of the past year's experience and of the estimates. The Committee and the Engineer would be placed upon their mettle; and they would doubtless try to again break their own record. That the low price of gas was appreciated in Widnes was seen from the comparatively large consumption. He did not think that in any town of the size of Widnes was there such a large consumption of gas for lighting and cooking. Practically, every householder in Widnes was a gas consumer. If the outlook had been clearer, the Committee would have felt warranted in recommending a reduction of 2d. instead of 1d.

Alderman Williamson, in supporting the motion, took a more sanguine view of the future than either of the two previous speakers. As had been pointed out already, sulphate of ammonia, tar, and coke were all rising with the price of coal. These three residuals were much in demand; and one (sulphate) was under the control of the gas makers of the country. If necessary, they would be justified in raising the price of gas; but he did not think that step probable. With the economies of their Engineer and the overlooking of the Gas Committee, he thought next year Widnes would be able again to lower the price of its already uniquely cheap gas. It was as likely that coal would go down again in price as that it would go up further; and they might, instead of conceding 1d. and 1½d. this year, have given 2d. and 3d.

The motion was unanimously carried.

The members of the Council were supplied with the following tables:—

Widnes Corporation Gas-Works.

Estimated Profit for Year ending March 25, 1900.

Profit, year ending March 25, 1899	£3499
Less reduction in price for June quarter of last year, not included in above	270
	£3229
Add increase in gas sales (7½ per cent.) including profit on extra gas sold, and reduction in standing charges	670
Increase in price and sale of coke	1100
" " " tar	250
" " " sulphate of ammonia	560
	£5809
Less extra price for coal—19,000 tons at 2s. per ton increase	1900
Estimated profit	£3909

Proposed Reduction in the Price of Gas.

To consumers of 3,000,000 cubic feet and upwards per annum, 1d. per 1000 cubic feet—*i.e.*, from 1s. 4d. to 1s. 3d. per 1000 cubic feet net	Amounting to £760
To consumers of under 3,000,000 cubic feet per annum, 1d. per 1000 cubic feet—*i.e.*, from 1s. 6d. to 1s. 5d. per 1000 cubic feet net	

	Per 1000 Cubic Feet.
Present price to slot consumers, 36 feet for a penny	= 2s. 3·78d.
Proposed price to slot consumers, 38 feet for a penny	= 2s. 2·32d.
Equal to a reduction of	1·46d.

This reduction of 1·46d. per 1000 cubic feet to slot consumers, on an annual consumption of 30,459,000 cubic feet, equals £200

The present prices outside the borough are as follow:—

			Reduced Prices Net.
Ditton and Hough Green	2s. 1d. less 3d.	= 1s. 10d. per 1000 feet net	1s. 9d.
Halebank	2s. 7d. "	= 2s. 4d. " "	2s. 3d.
Hale	3s. 1d. "	= 2s. 10d. " "	2s. 9d.
Bold	2s. 1d. "	= 1s. 10d. " "	1s. 9d.

The last reduction of 2d. per 1000 cubic feet was made on July 1, 1898.

SOUTHPORT CORPORATION GAS SUPPLY.

A Proposed Reduction in Price—Gas Consumers and the Rates.

A proposal that the price of gas should be reduced led to much discussion at last Tuesday's meeting of the Southport Town Council—the main questions being, first the old one as to whether the consumers or the ratepayers should have prior consideration in the disposal of the profits, and, secondly, as to whether now was the best time to effect the reduction in the interests of the gas undertaking.

Mr. Dimond opened the debate by moving that the price of lighting gas be reduced from 3s. to 2s. 11d. per 1000 cubic feet from the end of the current quarter. In support, he said he thought this was a very modest beginning; and he hoped the Council would carry the resolution, and that next March they would be able to reduce the price by 2d. more. The cost of producing the gas during the past year was 1s. 11¼d., while the previous year it was 2s. 4¼d. In that year they were £4500 short of what they estimated the profits would be; and this amount had been paid out of the profits of last year, so that it would not be a charge against them this year. He thought to call on the gas consumers to pay 2s. 10½d. for an article which only cost them 1s. 11¼d. was too much. During the

current year, since April 1, they had increased the sale of gas by 1¼ million cubic feet. Though the cost of material was somewhat more, labour was rather less; and the net cost of gas was ½d. per 1000 cubic feet more than last year. This being the case, he thought it was only right that the gas consumer should have some share in the profits. He proposed that the reduction should apply to lighting gas only; but by-and-by he hoped they would be able to get down to 2s. 6d. all round. This would enable them to abolish the large capital account they had through the duplication of meters; and he hoped the undertaking would be able to produce large profits for the benefit of the ratepayers.

Dr. Weaver seconded the motion.

Mr. Holland had never approved of a reduction in the price of gas so long as they had a large account hanging up against them, and also considering that they had raised the rates. If they wanted to benefit the ratepayers, they must lower the rates. Mr. Dimond talked of giving them a share of the gas profits; but they were always getting a share of them, because they were all ratepayers. It was infinitely of more importance to the town that they should have a penny off the rates than off the gas. People when they came to the town asked what were the rates, not what was the price of gas. Again, if they lowered the price of gas in Southport, they would have to reduce it in Birkdale; and they were now getting little enough from Birkdale, considering the advantages the people there received. Let them get the rates down to the old level, and then they could talk of lowering the price of gas.

Mr. Hulme hoped that before the Council reduced the price of gas, they would make an endeavour to clear off the debts they owed. They should keep the price of gas as it was until there was a surplus to give the ratepayers.

Alderman Griffiths, the Chairman of the Gas Committee, considered it was somewhat unkind that, in the middle of the financial year, a resolution of this kind should be sprung upon them. The matter was brought before the Committee, and was not accepted by them; and it was a precedent which he hoped would not be accepted by the Council that a Committee in the middle of the financial year should be interfered with to the extent of £1000 or £1200. They were doing their level-best; and he believed, by careful attention to the estate, they were going to save the ratepayers a large sum of money. He took it as exceedingly unkind that the ex-Chairman of the Gas Committee, who had the privilege of making a net profit of over £15,000, should, when he was no longer Chairman, move a resolution not to give his successor an equal chance with himself. Mr. Dimond knew that circumstances were against the present Committee. On March 25 next the Council would have the money they had made, and then could deal with the matter with all the facts before them. Mr. Dimond said that the Committee made gas at 1s. 11½d. and sold it for 2s. 10½d. If they calculated the whole output of gas, it would be found that they did not make 11d.; and the statement was inaccurate to the tune of a total of £3500. When the whole finances of the year were ready, it might be found that they could deduct 1d. or 2d. from the rates. He would rather it should be taken off the rates than off the price of gas; but it was quite possible a reduction might be made on both. Was it wise to persist in this policy of paring everything down in this way? The promotion of a Bill in Parliament had been talked of; and he wished to remind the members that they could not promote Bills under an expenditure of £2000 or £3000. He had taken a principal part in making half-a-million of money in Southport, and he did not like to see the gas estate played with. It was a physical impossibility for the Gas Committee to make the same profit as last year.

Mr. Karr expressed himself as unable to vote for the motion, because he thought it was brought forward at the wrong time. If it had been introduced last year, he certainly would have supported it.

Mr. Hesford said the great argument used against the resolution was that it ought to be left until March 25 next; but he wished to point out that before the Gas Manager's report was issued, the rates were laid. The price of lighting gas in Birkdale was 3s. 6d., and in Ainsdale 4s.; and his own feeling was that the reduction should be made off the whole. He thought it very desirable as a matter of policy that the Council should abolish the present differential prices, both with regard to lighting and other gas. At the present time there were 3600 places in which two meters had been fixed; and the number of these was increasing year by year. Last year the increase amounted to 600 meters. The capital charge for this had run to an enormous sum—about £600 a year, taking the basis of the 20 years' purchase. Previously the gas consumers were of the wealthy class; but the standard of gravity was shifting, and the lower classes were becoming the consumers, with the result that those who used electric light were being relieved of their rates at the expense of the gas consumer. This was manifestly unfair.

Alderman Fisher wished they could discuss these questions without its being supposed that they were attacking the Chairman of the Committee. The profits were such as they had never made before for twenty years, with one exception, when the price was put up to 3s. 3d. per 1000 cubic feet. Now the Committee said: "Trust us and do not interfere with us in the middle of a financial year." But when would be the right time to interfere? As had been said, when the rates were laid, they did not know what the gas profits would be. It was nothing but common justice that the gas consumers who had made this enormous profit should have some share in it, and he thought Mr. Dimond had been very modest in his demand. They would have no balance of £4500 to pay off this year, and yet last year they put £970 to the gas-cooker account, £1139 to the renewals fund, and £1000 to the reserve fund, whereas they had never before ventured to go beyond £200. He did not think they should pile up a big reserve fund for the benefit of the next generation.

Dr. Weaver said he should like to have had 3d. off the price of gas; but they could not go to that length at present. Mr. Holland had remarked that they ought to pay off all back debts; but he (the speaker) did not agree that the gas consumers should pay off the debts of the past. If they had debts, let them be paid out of the rates. They ought to bear in mind that there was a coal syndicate threatening them with increased rates for coal; and if this happened, they would lose £4000 on coal and oil. Then if they took off a penny per 1000 cubic feet, that would mean £1200, making £5200, and reducing the profits of last year to £10,000. As they had undertaken to hand £9000 over to the rates, what did they want any more for? If they had an increased business, this would reduce their loss still more, so that they would be on safe ground in taking off this penny.

Mr. Travis said he wished the members of the Council would see the Committee's balance-sheet before fixing their dividend. That was what common-sense men of finance would do. The Committee had promised to pay £9000 to the rates; and if there was anything over, then would be the time to reduce the price of gas. If they could reduce the price 3d. per 1000 cubic feet, it should have his vote; but he was not going to vote for the present reduction without seeing how it was to be paid. If they took a penny off the price in Southport and not off the charge in Birkdale, this would be another injustice to their neighbours.

Dr. Isherwood was against the reduction at the present time. It had been shown that the gas estate was making £15,000 profit; but it must be remembered they were now paying 5 per cent. more for oil for enriching purposes than they were last year. This seemed a most inopportune time to propose such a reduction. It was not for the gas consumer to pay the rates of the borough; and if they could take 2d. or 3d. off the price at the end of the year, he should vote for it.

Mr. Dimond, replying on the discussion, said Dr. Isherwood knew that they had entered into a contract that afternoon for oil at ¼d. a gallon less than they had been paying. The total increase in the cost of manufacture would be ½d. per 1000 cubic feet; and he thought he was safe in saying that they would make, if not £15,000, enough profit to pay for this reduction. He asked the Council to do an act of justice to the gas consumer by passing this modest resolution.

On the vote being taken, 9 members voted in favour of the motion, and 17 against it.

BURY CORPORATION GAS SUPPLY.

The Manager's Annual Report.

At the Meeting of the Bury Corporation on the 6th inst., the minutes presented by the Gas Committee contained the annual report of the Engineer and Manager (Mr. H. Simmonds), which was submitted to them at their meeting on the 21st ult., and approved. Mr. Simmonds reported that the total quantity of gas made was 340,511,500 cubic feet, of which 3500 cubic feet were produced from benzol. The quantity sold to private consumers was 300,000,150 cubic feet; for public lighting, 26,222,100 cubic feet; used on the works and for public clocks, 6,854,500 cubic feet—making a total of 333,076,750 cubic feet. The loss through leakage, &c., amounted to 7,434,750 cubic feet, or equal to 2·2 per cent. There were 34,345 tons of coal carbonized, and the production of gas per ton was 9914 cubic feet, compared with 35,749 tons and 8927 cubic feet in the twelve months ending March 31, 1898. The coke made for sale amounted to 14,476 tons, or 8¼ cwt. per ton of coal carbonized; sulphate of ammonia, 429 tons, or 28 lbs. per ton. For the year 1897-8, the figures were 12,934 tons and 7¼ cwt., 331 tons and 20¾ lbs. The cost of manufacture, distribution, management, &c., per 1000 cubic feet of gas sold, was 1s. 11·076d.; less tar, sulphate, coke, and sundries, 8·088d.—leaving 1s. 2·988d. Add interest on loans, stock, and sinking fund, 8·160d.; making a total of 1s. 11·148d. The income from gas was 2s. 2·340d., and the profit (£4500) 3·192d. per 1000 cubic feet sold. The estimated cost for the ensuing year is as follows: Total cost of manufacture, distribution, &c., per 1000 cubic feet, 2s. 1·128d.; less tar, sulphate, &c., 8·376d.—leaving 1s. 4·752d. Add interest on loans, &c., 6·696d.—total, 1s. 11·448d. By revenue from gas, 2s. 2·340d.; estimated profit, £4000, or 2·892d. At the end of March, 1898, there were connected to the mains 2170 lamps. Forty of these had been taken down to make room for 18 electric lamps; and 33 additional lamps erected in various parts of the town made a total of 2163 lamps in use at the end of the financial year. At the end of March, 1898, the Gas Committee had a total of 1178 stoves in use; but now they have 1302—being an increase of 124. In addition, they brought out 279 stoves; but these have been refixed—making a total of 403 stoves fixed during the year. Last year they had 656 grillers in use; but this number has been increased by 145—giving a total of 801 now in use. There were fixed during the year 195 prepayment meters, which, with the 1060 in use at the end of 1897-8, made a total of 1255. Eleven gas-engines were fixed in the town; making a total of 66 connected to the mains. There were 3631 yards of new mains laid during the year, varying in size from 2 to 6 inches internal diameter; and as there had been taken out 704 yards, and replaced with others of larger diameter, there was in use at the close of the year a total length of 135,213 yards, or 76 miles 1453 yards. There were 218 new services laid into buildings, as well as 407 to replace old ones. The works are in an efficient state of repair. During the ensuing year extensions will be made to the purifying plant. At present, the area of the purifiers is 3246 superficial feet. The extension now in progress will give an additional 4590 superficial feet; making a total of 7836 superficial feet. The minutes were confirmed.

THE TONBRIDGE GAS COMPANY AND THE GAS SUPPLY OF THE DISTRICT.

Consents of Local Authorities Dispensed With.

As mentioned in the "Journal" last week, the Tonbridge Gas Company have applied to the Board of Trade for a Provisional Order to sanction, among other things, the extension of their limits of supply. Of course, the consents of the various Local Authorities concerned were necessary; and these were obtained with two exceptions—the Sevenoaks Rural District Council and the Hildenborough Parish Council. The Company thereupon asked the Board of Trade to exercise the powers conferred upon them by section 4 of the Gas and Water Works Facilities Act, 1870, of dispensing with the consents of these Authorities. The Board sent down Lieut.-Col. H. A. Yorke, R.E., to inquire into the matter; and he reported that, so far as the Order was concerned, the responsibilities of the Sevenoaks District Council were limited to the roads in the parish of Leigh, and that the Leigh Parish Council, who were the Lighting Authority, had, after careful consideration, given their consent to the application. Sevenoaks desired that a clause should be inserted in the Order prohibiting the Company from supplying Leigh except on the invitation of the District Council, or, as an alternative,

that if and when the Company desired to lay their mains into Leigh the District Council should have the power to veto the work. The Parish Council of Hildenborough gave their consent to the application subject to the extension of the limits of supply so as to include certain houses. The promoters were willing to agree to this condition; but it was doubtful whether such an extension of the area of supply as originally proposed could be authorized by the Board of Trade. Colonel Yorke further reported that he was of opinion that it would be for the interests of the parish of Leigh that the conditions desired by the Sevenoaks Council should not be inserted in the Order, and also that the consent of the Hildenborough Parish Council should be dispensed with in the event of it being impossible to give effect to the condition imposed by them. He at the same time directed the attention of the Board to the proposal to authorize a standard price of 4s. 6d. per 1000 cubic feet in respect of gas supplied within the extended area, which, in the circumstances, he concluded was too high. After considering the report, the Board decided to dispense with the consent of the Sevenoaks Council; and as the Board were unable to give effect to the condition attached to the consent of the Hildenborough Parish Council, owing to the extensions asked for not being covered by the notices given by the promoters, they decided to dispense with the consent of that Authority also, and to grant the Order applied for, subject to certain modifications and amendments as regards price, &c.

ELECTRIC LIGHTING NOTES.

The Maidstone Urban District Council have decided to carry out a scheme of electric lighting, submitted by Messrs. Stevens and Barker, at a cost of £22,500.

The Crewe Town Council have accepted contracts for electric lighting plant amounting to £22,000. The Chairman of the Committee (Mr. A. G. Hill) anticipates that from the scheme a "golden harvest" will be reaped in a few years. May his expectations not be disappointed.

The Engineer of the Blackburn Corporation electricity undertaking, in his annual report, states that a profit of nearly £3000 has been secured on the past year's working, notwithstanding loss through the delay in the installation of the plant, and an increase in the price of coal. A sum of £30,000 is to be immediately spent upon a further extension of the electric tramways.

The annual balance-sheet of the Tunbridge Wells electric lighting undertaking shows that during the year ending March 31 the total income, after making ample provision for allowances, bad and doubtful debts, &c., was £7380, as against £5816 in the preceding year—an increase of £1564, or 27 per cent. The total working expenses amounted to £3395, against £2750 last year, being an increase of £645, which was equivalent to 23 per cent. The gross profit of the year amounted to £3985, against £3046 last year—an increase of £938, or a little over 30 per cent. Out of this sum, provision had been made for the interest on and repayment of borrowed capital, &c., to the extent of £1813; leaving a net profit of £2172, against £1710 last year—an increase of £561, or nearly 34 per cent.

The Devonport Corporation intend to purchase a site in the neighbouring district of East Stonehouse for an electric lighting station. There is little land of a suitable character anywhere in the district; and the Corporation Electric Lighting Committee appear not to have taken kindly to the idea that an arrangement should be made with Plymouth for the supply of the current, although there are no reasons, apart from the jealousy between the towns, why this should not be done. If Devonport should establish its works in Stonehouse, the probability is that an arrangement would be made with the District Council for the supply of the electric light in the township. The Stonehouse District Council have obtained a Provisional Order; but most likely the current will be supplied by one of the neighbouring Corporations.

Last Wednesday, Mr. G. W. Willcocks held an inquiry, on behalf of the Local Government Board, into an application from the Worthing Town Council for permission to borrow £36,900 for the purpose of introducing a scheme of electric lighting into the town. The Town Clerk (Mr. W. Verrall) furnished statistics from which it was gathered that the area of the borough was 1406 acres, the estimated population 21,000, the assessable value £105,929, and the outstanding loans £156,807, less £9350 in the sinking fund. Several ratepayers who were present intimated their intention of opposing the application. Mr. H. H. Gardner, the Chairman of the Worthing Gas Company, said he was present on their behalf to see that the interests of the ratepayers were properly protected. The Town Clerk expressed his surprise at the unexpected nature of the opposition. He said the scheme had been very carefully considered, and had received the sanction of the Board of Trade. The Council were unanimous in the application. Mr. Ovenden, the Chairman of the Electric Light Committee, spoke at length in support of the scheme. He said that, from a financial point of view, the Council were in a position to incur the whole of the proposed expenditure of £36,900 at once, and still leave a margin on their borrowing powers. The necessary part of the scheme would only involve a portion of the outlay to begin with, and probably some £6000 or £8000 would not be required until the demand for the supply of the current justified the extension. Mr. Gardner said he hoped the Inspector would satisfy himself that the demand for the electric current was reasonably sufficient to provide for the interest on the loan and the cost of producing the light. He objected to having the rates tapped for the benefit of the few. Mr. W. E. Monkhouse gave technical details of the scheme, which provided 6000 lamps for private consumers and the public lighting. It was proposed to charge 6d. per unit for private lighting, and 2½d. per unit for the public lamps.

The Danger of Blowing Out the Gas.—Shortly before eight a.m. last Thursday week, a police constable was summoned to a private temperance hotel in Liverpool, where, in a bedroom on the first floor, he found a woman named Catherine Coleman, 60 years of age, and a boy named William Davies, aged 10—the former on the floor and the latter in the bed—both insensible. All attempts at restoration being unsuccessful, they were conveyed to the Northern Hospital, and remained there as in-patients. Both eventually recovered consciousness, and made good progress towards convalescence. The gas had been left turned full on all night—having probably been blown out.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The Falkirk Gas Commissioners have closed a year which has resulted very unsatisfactorily financially. With a total revenue of £17,835, and an expenditure in working of £12,393, upon feu-duty, taxes, and insurance of £1393, and upon discounts of £516—a total of £14,302—there was a gross profit of £3533. But interest upon Corporation stock, of which the capital almost entirely consists, and contributions to sinking fund, amount to £4759; so that there is a loss on the year's transactions of £1226. The amount of Corporation stock held by them was reduced during the year by £3 17s. 2d., and now stands at £110,114 3s. 6d. In addition, during the year the Commissioners borrowed £7000 on temporary loans, at 2½ per cent.; and they have thus a capital of £117,000. It is dispiriting work to face a deficit, and particularly so when it is experienced in two successive years—for there was a deficit reported a year ago of over £200. As to the causes which have led to this state of matters, the Commissioners have scarcely given any explanation. When the accounts were presented to the Town Council, on Tuesday, Provost Weir said that the price of coal had been higher and the price of gas cheaper; and Bailie Cook Rennie, the Convener of the Gas Committee, explained that the expenditure upon coal last year was £7328, as compared with £5635 in the previous year. The Council deferred consideration of the accounts until after they are discussed by the Gas Committee, who are also to have before them reports by the Manager (Mr. J. Kincaid) as to the condition of the gas-works and the advisability of seeking a new site for them. Some light as to the disadvantages under which the works are conducted was thrown by remarks at a meeting of the Gas Commissioners the previous day. It was stated that there had been some difficulty with the carting contractor, in connection with which it was elicited that the carter said the Railway Company had too little siding accommodation, and that the Railway Company said the carter had too few horses. The suggestion was made that the Commissioners should keep a carting staff of their own; but it did not find favour, the Provost's remark being more popular, when he said that he did not think they would ever save money until they had railway sidings into the works, but that this matter would come up by-and-bye. The cost of carting is about £700 or £800 a year. There is little doubt but that, if there were railway communication with the works, the Commissioners' expenditure would be at least £1000 a year less.

These remarks occurred in conversation in the course of considering the report of the Manager upon the coal supply for the year. Mr. Kincaid recommended the purchase of 8400 tons of coal, at an average price of 13·78s. per ton, which is about 1s. per ton higher than last year's contracts. He considers that probably another 1000 tons will be required; but that this need not be contracted for till the spring. It seems that there is a stock of coal on hand which enables the Commissioners to adopt this independent attitude; and they have also taken into account, in falling in with Mr. Kincaid's recommendation, that there is a chance of coal being cheaper in the spring.

The Kilmarnock Gas Committee's financial year has also ended with a deficit, in their case, of £812; but this is brought about merely by the method adopted of working the undertaking. So far as I can make out, if the cost of extensions (£379), and the cost of new meters (£800), were charged against capital instead of against revenue, there would be a surplus of £745. As presented on Wednesday, the revenue was stated at £16,835, and the expenditure at £16,569—leaving a surplus of £266. The contribution to the sinking fund is £700; and the cost of extensions being added, makes a charge of £1078 upon the gross profit. There being only £266 to meet this, the deficit is £812. But I have not seen the full accounts yet, and am not very sure of my ground. The Committee recommended that the price of gas be increased from 2s. 6d. to 2s. 8½d. They did this in the full knowledge that the deficit had been caused by their charging to revenue what should have been charged to capital; and, what is more, in the knowledge that a similar policy had landed them a year ago with a deficit of £1215. They are thus in the position of having a debit of £2027 at what may be called a suspense revenue account. The intention is to wipe out this sum whenever they have a net profit. The increased price of 2½d. is scarcely expected to enable them to do more than hold their own during the current year—if, indeed, they do not go further behind; but they are prepared to take the risk of this, and, of course, to carry forward whatever debit there may be, greater or less, at the close of the current year. There was a strong feeling in the Town Council that the increase in price should be 5d. per 1000 cubic feet; but a majority decided that it should be 2½d., as recommended by the Committee. Nothing can be said against the policy of the Commissioners; but it does not commend itself to me. They have a splendid business. To compare them in two particulars with Falkirk, they have an annual output of 113 million cubic feet of gas, as against 100 million in Falkirk; but their capital is only about £23,000, whereas we have seen above that at Falkirk it is £117,000. The addition of £2000 of capital at Kilmarnock would be adding a straw which the camel would never feel on its back; and then the price of gas might be even reduced, instead of being raised. There cannot be any fear on the part of the Commissioners as to the demand for gas outstripping the means of production, because, with the recent extensions, the works are capable of a much larger output than exists; and in the matter of storage capacity, there is provision very largely in excess of the maximum daily make. Of course, it must not be forgotten that there is just the other side to this question—that there will be no more extensions of any consequence for a time, and that, consequently, it may be better not to interfere with the regular movement of the capital account, but rather to tide over present ills, well knowing that at any moment, and without effort, they can be wiped out. But, after all, is not oscillation in price one of the most baneful influences which can affect a gas undertaking? Navigators, when in cross-currents, consider it better to load the ship rather than to allow her to roll.

The Gas Committee have effected an insurance of their workmen against claims under the Workmen's Compensation Act, at the rate of 4s. 9d. per £100 of wages paid. Last year the rate was 15s. per £100; and the reduction is explained to be on account of its having been found that the operation of the Act has led to a decrease in the number of accidents. Is not this explanation, given by Provost Mackay, of Kilmarnock, contrary to the general belief?

The annual meeting of the Cupar Gas Company was held on Thursday. A most gratifying state of matters was reported. The Chairman said that the output of gas last year was 19¼ million cubic feet—an increase of 4 million cubic feet in five years. They had found it to be absolutely necessary, in the carrying on of their increasing business, to have more storage for gas, and they had resolved to erect a new gasholder, of 100,000 cubic feet capacity, at a cost of about £3000. No difficulty had been experienced in getting the necessary money from their shareholders. He had observed, within the last few days, their 5 per cent. preference shares changing hands at £12 each, or a premium of £2—a fact which showed that, in the mind of the public, the Company's business was being conducted on sound financial principles. They were having an increased number of consumers through penny-in-the-slot meters; the revenue from them alone having been over £80. The increase in the price of coal for this year meant an additional expenditure of £200; and though they might realize from £50 to £60 more for residual products, the loss would amount to at least 2 per cent. on the ordinary stock. He trusted they would not be under the necessity of raising the price of gas. Personally, he would be inclined to take a little less dividend than do so. The Directors' report showed a gross profit of £920. A dividend on the ordinary stock at the rate of 40s. per share absorbed £500, £200 was voted for depreciation, and £100 was placed to reserve fund—£49 being carried forward. The Directors regretted that, on account of the increase in the cost of coal, they were unable to reduce the price of gas, as they had hoped to do; but they were pleased to be able to avoid raising it.

The Commissioners of Broughty Ferry, finding themselves behind other places in the matter of the supply of gas stoves and heaters, have resolved that they shall not only let them out on the hire-purchase system, but also hire them out at a rent of 5 per cent. on the list price. It has further been resolved, in all cases where the existing service-pipes are inadequate, to replace them by larger ones, free of charge, for distances not exceeding 50 yards; greater distances to be laid upon terms to be negotiated. Mr. Christie, the Convener of the Gas Committee, bore testimony to the care and energy with which the gas-works had been conducted by Mr. A. Waddell, the Manager, who, he said, had run them on spirited lines during the past five or six years. Mr. Kidd remarked that it said a great deal for the forward policy of the Commissioners that they were able to continue the price at 2s. 11d. per 1000 cubic feet. A Commissioner having expressed a wish to know when the expenditure at the gas-works was to cease, Mr. Christie pointed out to him that during the past five years the consumption had increased by 10 milion cubic feet, and that it was impossible that the same plant could have overtaken the extra demand.

The Galashiels Gaslight Company earned a profit last year of £2103, which, with £5828 brought forward, made a balance at the credit of profit and loss account of £7931. A dividend at the rate of 10 per cent. has been paid, absorbing £2100; and £5831 has been carried forward. The quantity of gas manufactured during the year was 51,561,200 cubic feet, and the amount sold 49,052,685 cubic feet—an increase on the previous year of 165,214 cubic feet. The loss by leakage was 2,008,515 cubic feet. The gross income was £9299, of which £8137 was from the sale of gas. The ordinary expenditure was £6551, and £645 was set aside for depreciation. The capital of the Company is £21,000; and the value of the works and plant is stated in the balance-sheet to be £23,850. The total assets are given at £28,931. The price of gas has been retained at 3s. 4d. per 1000 cubic feet.

Provost Smith, of Peterhead, has a happy way of presenting the annual accounts of the Gas Commissioners. Speaking at a meeting of the Commissioners on Monday, he said that the only popular interest that gathered around the annual report of the Gas Committee lay in the question whether they could recommend any abatement in the price for the current year. But, considering the low price that was now charged on the one hand, together with the steady advance in the price of coal on the other, the prospect of any further reduction must be considered in the meantime as not very hopeful. He found that the revenue for the year ended May 15 had increased from £3740 to £3868; made up by an increase of £138 on the gas sold, and a loss of £10 upon the residual products, as compared with last year. If the revenue had increased, the expenditure had also increased. Last year it was £2805, but now it stood at £2998; showing an additional expenditure of £193, which was made up of two items—an increase of £141 in the amount paid for coal, and of about £36 on main and service pipes. The balance carried to net revenue, which last year amounted to £934, this year was £869. But this balance was absorbed by two things—by £508 10s., the amount carried to the sinking fund according to statute; and the interest on the mortgages, which had amounted to £447 12s. 10d.—so that they had hardly earned enough profits to pay these two items of expenditure. The result of the whole operations of the year had been that they had sustained a loss of £64. They had all heard of a balance standing at their credit, which last year amounted to £2402, and now amounted to £2338. There was a popular notion that this £2338 consisted of ready money; and people sometimes asked why the price was not reduced, if there was so much cash. Unfortunately, this balance was largely a matter of accounting. The gas sold amounted to 16,846,900 cubic feet, an increase of 840,000 cubic feet upon the previous year. The leakage, which last year was 13·6 per cent., now stood at 12·2 per cent., which was a very substantial and gratifying feature. He concluded, by moving that there be no alteration in the price of gas for the current year; and this was agreed to.

The Alloa Gas Commissioners had a revenue last year of £9406, of which £7397 was derived from the sale of gas, £1113 from tar, ammoniacal liquor, and sulphate of ammonia, and £813 from coke and refuse lime. The total expenditure was £8499, of which £3796 was for coal, oil, and lime, £1835 for wages, and £1308 for repairs and furnishings. The gross profit was £906. Of this sum, £892 has been placed to sinking fund, which now stands at £15,877. The capital liabilities of the undertaking amount to £27,791, of which £15,050 was added last year. During the year two exhauster engines were added, and other alterations were made at the works, at a cost of £609; and there was expended £200 upon extensions of mains, and £100 upon new meters.

The Alva Gas Commissioners have reduced the price of gas from 3s. 11d. to 3s. 10d. per 1000 cubic feet.

It was reported, at a meeting of the Dunfermline Gas Commissioners on Monday, that during the past year the Commissioners had a revenue of £13,331, of which £11,827 was derived from the sale of gas, £206 from meter and stove rentals, £497 from coke, and £800 from tar and

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 169.

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
590,000	10	Apl. 13	10½	Alliance & Dublin 10 p. c.	21½—22½	..	4 13 4
100,000	10	,,	7½	Do. 7 p. c.	15½—16½	..	4 10 11
800,000	100	July 3	5	Australian 5 p. c. Deb. .	102—104	..	4 16 2
200,000	5	May 12	6	Bombay, Ltd. . . .	6½—6⅝	..	4 8 11
40,000	5	,,	6	Do. New, £4 paid .	4½—4⅝	..	5 1 1
380,000	Stk.	Feb. 24	12	Brentford Consolidated	275—280	..	4 5 9
240,000	,,	,,	9	Do. New . . .	215—220	..	4 1 10
50,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0
159,375	,,	June 15	4	Do. 4 p. c. Deb. .	126—130	..	3 1 7
220,000	Stk.	Mar. 29	11½	Brighton & Hove Orig. .	265—270	..	4 5 2
226,320	,,	,,	8½	Do. A. Ord. Stk. .	194—197	..	4 6 4
973,500	Stk.	Feb. 24	5	Bristol, 5 p. c. max. .	125—130	..	3 16 11
420,000	20	Mar. 29	10	British	45—47	−1	4 5 1
50,000	10	Feb. 24	12	Bromley, Ord. 10 p. c. .	25—27	..	4 8 11
75,000	10	,,	9	Do. 7 p. c. . . .	20—22	..	4 1 10
500,000	10	Apl. 27	6	Buenos Ayres (New) Ltd.	10—10½	..	5 14 3
220,000	Stk.	June 29	4	Do. 4 p. c. Deb. .	100—102	..	3 18 5
150,000	20	July 13	8½	Cagliari, Ltd. . . .	28—29*	+½	5 13 10
100,000	10	June 1	7½	Cape Town & Dis., Ltd.	13—14	..	5 7 2
50,000	50	May 2	6	Do. 6 p. c. 1st Mort.	56—58	..	5 3 5
550,000	Stk.	Apl. 13	13½	Commercial Old Stock .	316—321	+2	4 4 1
200,750	,,	,,	10½	Do. New do. .	245—250	..	4 4 0
200,750	,,	June 15	4½	Do. 4½ p. c. Deb. .	143—148	..	3 0 10
800,000	Stk.	June 15	10	Continental Union, Ltd.	187—192	..	5 4 2
200,000	,,	,,	7	Do. 7 p. c. Pref. .	182—187	..	3 14 10
51,600	Stk.	Feb. 24	14	Croydon A 10 p. c. . .	—	—	—
168,400	,,	,,	11	Do. B 7 p. c. . .	—	—	—
555,000	Stk.	Feb. 24	5½	Crystal Palace Ord. 5 p. c.	135—140	..	3 15 0
60,000	,,	,,	5	Do. 5 p. c. Pref. .	140—145	..	3 9 0
486,090	10	Jan. 27	11	European, Ltd. . . .	23—24	..	4 11 8
354,060	10	,,	11	Do. £7 10s. paid .	17—18	..	4 11 9
14,993,075	Stk.	Feb. 10	4⅝	Gas- 4 p. c. Ord. . .	104—106	−1	4 12 5
2,600,000	,,	,,	3½	light 3½ p. c. max. .	95—98	..	3 11 5
3,799,735	,,	,,	4	and 4 p. c. Con. Pref.	126—128	..	3 2 6
3,843,975	,,	June 15	3	Coke 3 p. c. Con. Deb.	99—101	..	2 19 5
70,000	10	May 31	8	Hongkong & China, Ltd.	13½—14½	..	5 10 4
3,900,000	Stk.	May 12	10	Imperial Continental .	225—230	+1	4 6 11
473,600	Stk.	Feb. 10	3½	Do. 3½ p. c. Deb. Red.	102—105	..	3 6 8
75,000	5	June 15	6	Malta & Medn., Ltd. .	5—5⅝	..	5 9 1
560,000	100	Apl. 4	5	Met. of 5 p. c. Deb.	112—114	..	4 7 9
350,000	100	,,	4½	Melbourne 4½ p. c. Deb.	110—112	..	4 0 4
541,920	20	May 31	5	Monte Video, Ltd. . .	13—14	..	7 2 11
617,946	Stk.	Feb. 24	9½	Newc'tle & Gatesh'd Con.	228—233	..	3 19 5
264,855	Stk.	June 29	3½	Do. 3½ p. c. Deb. .	106—109	..	3 4 3
				* Ex div.			

Issue.	Share.	When ex. Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	GAS COMPANIES.			£ s. d.
150,000	5	May 31	8	Oriental, Ltd. . . .	7⅞—8	..	5 0 0
135,000	5	,,	8	Do. New, £4 10s. pd.	6½—7	..	5 14 3
15,000	5	,,	8	Do. do. 1879, £1 pd.	1½—1⅝	..	4 11 5
60,000	5	Mar. 29	7	Ottoman, Ltd. . . .	5½—6	..	5 16 8
500,000	100	June 1	6	People's Gas 2nd Mtg. of Chicago Bonds .	102—106	..	5 13 2
851,070	10	Apl. 27	7	River Plate Ord. . . .	11½—11¾	+¼	5 19 2
250,000	Stk.	June 29	4	Do. 4 p. c. Deb. .	101—103	..	3 17 8
250,000	10	Mar. 29	10	San Paulo, Ltd. . . .	17—18	..	5 11 1
135,000	Stk.	Mar. 29	10	Sheffield A.	244—249	..	4 0 4
209,053	,,	,,	10	Do. B.	244—249	..	4 0 4
447,427	,,	,,	10	Do. C.	244—249	..	4 0 4
5,600,000	Stk.	Feb. 10	5½	South Metrop., 4 p. c. Ord.	135—140	..	3 16 2
1,460,000	,,	July 13	3	Do. 3 p. c. Deb. . .	100—102*	+½	2 18 10
120,000	Stk.	—	6	Tottenham A. 5 p. c.	143—145	..	4 2 9
250,520	,,	—	4½	and B. 2½ p. c.	103—105	..	4 5 9
55,100	,,	—	4	Edmonton 4 p. c. Deb. .	115—120	..	3 6 8
182,380	10	June 15	5	Tuscan, Ltd.	9—10	..	5 0 0
149,900	10	July 3	5	Do. 5 p. c. Deb. Red.	98—100	..	5 0 0
				WATER COMPANIES.			
746,184	Stk.	June 29	11	Chelsea, Ord.	315—320	..	3 8 9
150,000	,,	,,	5	Do. 5 p. c. Pref. .	167—170	..	2 18 10
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	148—153	..	2 18 10
175,785	,,	Mar. 29	4½	Do. 4½ p. c. Deb. .	155—160	..	2 16 3
1,720,560	Stk.	Apl. 18	7	East London, Ord. . .	218—222	−2	3 3 0
654,740	,,	June 29	4½	Do. 4½ p. c. Deb. .	155—158	..	2 17 0
390,000	,,	,,	3	Do. 3 p. c. Deb. .	101—103	..	2 18 3
700,000	50	June 15	7½	Grand 10 p. c. max. .	111—114	..	3 5 9
310,000	Stk.	Mar. 29	4	Junction 4 p. c. Deb. .	135—140	..	2 17 2
708,000	Stk.	Feb. 10	14	Kent	360—365	..	3 16 9
160,000	,,	,,	7	Do. New, 7 p. c. max. .	210—215	..	3 5 1
1,043,800	100	June 29	10½	Lambeth, 10 p. c. max. .	298—303	..	3 9 4
406,200	100	,,	8	Do. 7½ p. c. max. .	225—230	..	3 9 7
350,000	Stk.	Mar. 29	4	Do. 4 p. c. Deb. .	135—140	..	2 17 2
500,000	100	Feb. 11	13½	New River, New Shares	430—435	..	3 3 3
1,000,000	Stk.	Jan. 27	4	Do. 4 p. c. Deb. .	137—142	..	2 16 8
902,300	Stk.	June 15	7½	South- Ord. . . .	204—209	..	3 11 9
126,500	100	,,	7½	wark 7½ p. c. max. .	193—198	..	3 15 9
489,200	Stk.	,,	5	and 5 p. c. Pref.	167—172	+2	2 18 2
1,019,585	,,	Apl. 13	4	Vauxhall 4 p. c. A Deb.	135—140	..	2 17 2
1,155,066	Stk.	June 15	10	West Middlesex . . .	298—303	−2	3 6 0
200,000	,,	,,	4½	Do. 4½ p. c. Deb. .	154—158	..	2 17 0
200,000	,,	Mar. 10	8	Do. 8 p. c. Deb. .	102—104	..	2 17 8
				* Ex. div.			

ammoniacal liquor. The total expenditure was £8114, of which £3754 was for coal, including carriage. The gross profit was £5690. Of this sum, £3004 was required to pay interest, and there was placed to sinking fund £2508. During the year, the capital of the undertaking was increased from £99,321 to £101,455; extensions of works having cost £2134.

The Directors of the Dalbeattie Gas Company reported to the shareholders recently that they regretted that, owing to the increased price of coal, and extra working expenses consequent on the breaking of pipes by a steam road-roller, there had been a loss on the year's working, and no dividend could be paid this year. As there was no prospect of an early reduction in the cost of coal, they were obliged to recommend that the price of gas be increased by 10d. per 1000 cubic feet. The deficiency on the year's working was £29. It was reported that about 95,000 cubic feet more gas had been consumed than during the previous year. The opinion was expressed that it would be better policy for the shareholders to go without dividend than to increase the price of gas. On a division, it was agreed, by a majority of one, not to increase the price.

It is reported from Johnstone that the business of the Corporation gas-works was larger during the past year than it ever has been in the history of the town. The revenue from the sale of gas amounted to £5780, from meter-rents to £60, from bye-products to £308, and from waste lime and coke to £381. The gross profit amounted to £3896, and the net profit to £311. The sinking fund shows that the Gas Commissioners have repaid £12,170 of borrowed money. During the year additions were made to the works, at a cost of £1500. The price of gas has not been increased, notwithstanding that coal has risen.

The Irvine Gas Company have paid a dividend of 10 per cent., and carried forward £500. A Committee of the Directors has been appointed to meet with the Burgh Commissioners, should they still desire to continue negotiations for the transfer of the Company's undertaking to them.

The Kirriemuir Gaslight Company have paid a dividend of 4½ per cent., which is ½ per cent. less than last year, and have increased the price of gas by 2½d. per 1000 cubic feet.

The Elgin Gas Commissioners had a revenue last year of £8625, of which £4813 was derived from the sale of gas, £515 from coke, and £132 from tar, &c. There was a net profit of £419 upon the working for the year. Coal cost £2516; the total expenses of manufacture were £3545, of distribution £320, and of management £123. A sum of £388 has been applied to depreciation, and £132 has been placed to sinking fund. The capital account was increased during the year by £147—expenditure upon new mains, meters, and stoves—and now stands, after deducting £4530 in respect of depreciation, at £14,720. The total liabilities amount to £12,600.

Some time ago, a Special Sub-Committee of the Glasgow Gas Trust was appointed to consider and report as to what arrangements should be made for utilizing the clay existing in the lands of Easter Blochairn for making the bricks required in the construction of the new gas-works to be erected on these lands. The Sub-Committee decided that, before further consideration of the remit, a joint report should be obtained from the Engineer (Mr. W. Foulis) and Mr. D. Rankine, as to what would have to be put upon the ground, and its probable cost. These gentlemen duly reported, and recommended the erection of two machines, with Hoffman kilns, equal to the production of 11 million bricks per annum, which they estimated could be done for £8000. They said the provision of this plant would facilitate the erection of the new gas-works, would provide a brick well suited for use on the grounds, and would leave a large margin of profit in addition to paying the cost of the erection of the brick-works. As the result of this report, and having regard to the saving to be effected, the Sub-Committee resolved to recommend that the plant referred to be put down by the Corporation, and that Mr. Rankine be authorized to prepare the necessary plans and specifications for it, and any requisite building, and to obtain and submit offers for providing and erecting the same.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *July* 15.

Sulphate of Ammonia.—The market has remained steady throughout the week; the closing quotations being £12 3s. 9d. to £12 5s. per ton, delivered f.o.b. at the ports. Demand has been sufficient to absorb current production; and makers have successfully resisted any further decline in values, but they have not been able to score an advance. The forward position is still neglected; the quotation of £12 per ton for October-December and October-March not offering sufficient inducement to buyers to operate.

Nitrate of Soda is firm in the forward position; but spot is quiet at 7s. 7½d. to 7s. 9d. per cwt., according to quality.

LONDON, *July* 15.

Tar Products.—The slight spurt last week in the prices of some of the tar products appears to some extent to have fizzed out, especially so far as regards benzol. For specially prepared qualities for gas enriching, somewhat better prices are available than for ordinary quality. There seems little life in anthracene, and no business of importance doing, nor are there sufficient inquiries to encourage hope for the article. Pitch is steadily inquired for, and is a fairly good market. Creosote and oils are steady.

Average prices are as follows: Tar, 15s. 6d. to 24s. Pitch, east coast, 28s. 6d.; west coast, 25s. 6d. Benzol, 90's, 7½d.; 50's, 8½d. Toluol, 1s. 2d. Solvent naphtha, 1s. 1½d. Heavy naphtha, 1s. Crude, 30 per cent., naphtha, 3½d. Creosote, 3½d. Heavy oils, 62s. 6d. Carbolic acid, 60's, 2s. 1d.; 75's, 2s. 8d. Creosote salts, 47s. 6d. Anthracene, "A," 3½d. to 4d.; "B," 2½d. to 3d.

Sulphate of Ammonia is not keenly sought; but the price remains about £12, less 3½ per cent.

The Urban District Council of Newton-in-Makerfield have accepted the tender of Messrs. R. Dempster and Sons, Limited, of Elland, for new condensing plant.

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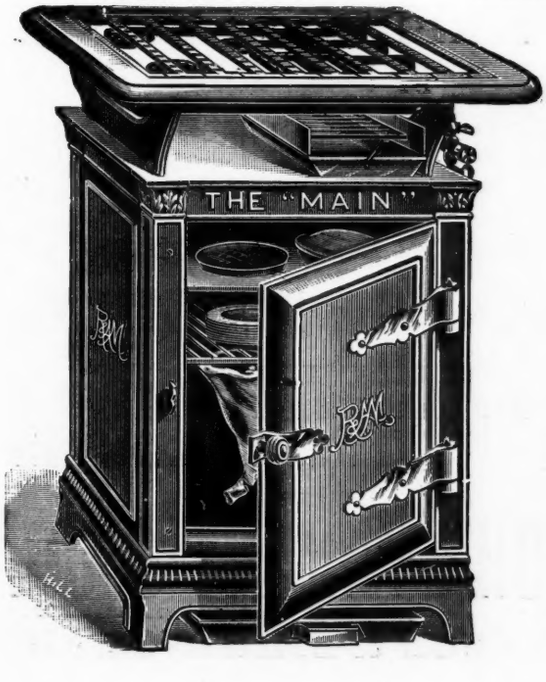

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COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—The position in the coal trade here remains practically unchanged. In the better qualities of round coal, there is the usual slow summer's trade doing, with pits on short time, and stocks accumulating, though not to any large extent. The Lancashire colliery owners are still holding pretty firmly to their list rates, notwithstanding a good deal of keen competition from other districts. Best Wigan Arley averages 11s. 6d. to 12s. 6d. per ton, Pemberton four-feet and seconds Arley 10s. to 11s., and common house coal 9s. to 9s. 6d. Common round coals, for steam and forge purposes, continue in brisk demand, and are firm at about 8s. 9d. to 9s. per ton at the pit. For engine fuel there is also an active inquiry, with collieries in many cases quoting some advance on current rates for forward contracts; but present market prices remain practically unchanged at about 6s. 6d. to 6s. 9d. per ton for best slack, 5s. 6d. to 5s. 9d. for medium, and 4s. 9d. to 5s. for common sorts. In the shipping trade there has, perhaps, been rather more doing, but with no change in prices. These remain at about 9s. 6d. to 9s. 9d. per ton for ordinary steam coal delivered at the Garston Docks, and 10s. at the High Level, Liverpool. Coke continues scarce, with prices very strong at the recent advance.

Northern Coal Trade.—There is a good demand for coal generally in the North-east of England, and prices are steady; the collieries having full work at a time when there is usually slackness in some of the branches of the trade. Best Northumbrian steam coals are steady at from 12s. 3d. to 12s. 6d. per ton f.o.b.; second-class steam are 11s. 6d., and steam smalls about 5s. 6d. The gas coal market is steady. The consumption is now beginning to increase, though slowly, at the local works, and there is a large export; so that the production is well taken up for the season. In regard to prices, the common quotation is now from 9s. 6d. to 10s. per ton f.o.b., for occasional cargoes of best Durham gas coals; while there is some contracting going on at rates that are about the lower of the two figures named. Manufacturing coals are in good demand, and are firm in price. Gas coke is unaltered in value, but exports are maintained, and stocks are not large.

Scotch Coal Trade.—Coal is more plentiful than it usually is at this season, which is accounted for by the decline of the export trade. The home demand continues to be strong, and prices are well maintained. These are: Main 8s. 9d. to 9s. per ton f.o.b. Glasgow, ell 9s. 6d. to 10s. 3d., and splint 9s. 9d. to 10s. The shipments for the week were 195,688 tons—a decrease of 30,457 tons upon the preceding week, and of 48,841 tons upon the corresponding week of last year. For the year to date, the total shipments have been 4,389,320 tons—a decrease of 416,369 tons upon the corresponding period of last year.

Subways in New York.—At the close of 1898, there were 2124 miles of subways in existence in New York; 155 miles of conduits for electric light and power, telegraph, and telephone purposes, having been laid in the year.

Explosion at the Beckton Chemical Works.—An explosion occurred in the chemical works of The Gaslight and Coke Company at Beckton shortly after noon last Thursday, by which two men were injured—one having his arm shattered. The men were removed in an unconscious condition to the Seamen's Hospital.

Newmarket Public Lighting.—The Lighting Committee have before them five tenders submitted by the Engineer and Secretary of the Newmarket Gas Company (Mr. J. H. Troughton) for carrying out a greatly improved scheme of public lighting for the town by Welsbach burners, at less than the present cost; also two tenders from the Electric Light Company, at somewhat reduced figures.

Extension of Plant at the Driffield Gas-Works.—Mr. Charles Perrin held an inquiry at Driffield last Friday relative to an application by the District Council to the Local Government Board for permission to borrow £3000 for gas-works renewals, extensions, &c. Mr. H. Tobey, of Malton, the Consulting Engineer to the Council, explained that the money was required for new and more modern retorts, new mains, and the purchase of gas-cookers and penny-in-the-slot meters.

Death from Suffocation by Coal Gas.—A Frenchman, whose name is believed to be Auguste Roques, was admitted to the Angel Hotel, Sheffield, last Tuesday evening, and on the following day was found dead in his room, the door of which was locked. There was an overpowering smell of gas, and the tap in the room was discovered turned on. Deceased had been seen asleep in his room earlier in the day, and there was then no odour of gas. A medical man was summoned, who pronounced death to be due to suffocation by gas.

Coventry Gas-Fittings Company, Limited.—At the annual general meeting of this Company last week, the Chairman (Mr. W. L. Robinson) said that during the twelve years of the existence of the concern dividends of 120 per cent. had been paid; being an average of 10 per cent. per annum. This year no dividend would be paid, but the business was in a thoroughly sound condition, and there were prospects of future success equal to the past. Alderman Andrews criticized the balance-sheet, especially as to the large stock of the Company. The report was adopted.

Electric Lighting and Gas Supply in Carlisle.—At the meeting of the Carlisle Town Council last Tuesday, the minutes presented by the Gas Committee contained a resolution that, in view of the introduction of electric lighting into the city, the consideration of a plan by the Engineer (Mr. C. B. Newton) showing the best means of developing to the fullest extent the existing gas-works be deferred, in order that it may be seen what effect (if any) the electric light has on the consumption of gas during the coming winter. In moving the adoption of the minutes, Mr. Coulthard said the Committee had gone into the question of an extension of the gas-works—a very large extension, which he believed would cost £28,000 when they undertook it. In the meantime, they had staved it off until they saw what result the electric light would have upon the consumption of gas. The Manager had given them to understand that he would be able to tide them over for this year, at all events. The minutes were confirmed.

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LONDON & BIRMINGHAM.

The Fire at the Guildford Gas-Works.—The fire at Guildford on Sunday, the 9th inst., referred to in the "JOURNAL" last Tuesday, was extinguished in about an hour, and although it caused great alarm in the neighbourhood, there was fortunately no personal injury. The fire was confined to the building in which it originated—the engine and exhauster house; and the principal damage was to this part of the plant. The loss is covered by insurance.

Value of Land Taken for Reservoir Purposes at East Finchley.—Some time ago, a claim was made by Mr. C. C. Paine, a builder, against the New River Company, for land taken, depreciation, and loss of profits in respect of about 5 acres of freehold land forming a portion of an estate of 17½ acres, situated on the Fortis Green Road, between East Finchley and Muswell Hill. The land was required by the Company for the construction of a reservoir in connection with the new supply of water to be obtained by them under the Staines reservoirs scheme. The claimant has been awarded £8844.

Brynmawr and Blaina Gas Company, Limited.—The half-yearly meeting of this Company was held last Wednesday, when the Manager and Secretary (Mr. T. Acland) reported that the sales of gas for the half year ending June 30 showed an increase of 1,200,000 cubic feet, compared with the corresponding period of last year. This was considered very satisfactory. It was decided to further increase the prepayment meter system before next winter season. During the past half year, new retort extensions were made, which will add 20 per cent. to the carbonizing power of the works. The maximum dividend at the rate of 10 per cent. per annum, free of income-tax, was declared.

Reductions in Price.—The Kirkby Lonsdale Gas Company have reduced the price of gas supplied for public lighting to 4s. 2d. per 1000 feet. The District Council asked for a reduction to 3s. 6d.; but they have accepted the Company's concession. As mentioned in another part of the "JOURNAL," the Rushden and Higham Ferrers Gas Company have reduced their price 1d. per 1000 cubic feet. Their charges are now 2s. 6d. net for public lighting; 3s. 4d., less 2d. discount for prompt payment, for private lighting; and 2s. 10d., with a like discount, for gas used for engines and cookers. The prepayment meter supply is at the rate of 22 cubic feet for 1d., less 7 per cent.; making it practically 23½ cubic feet.

Sales of Shares.—On Monday last week, Mr. C. A. Joel sold by auction £50,000 of 5 per cent. preference stock (1894) of the Newcastle and Gateshead Water Company. It was put up in lots of £100, which fetched from £165 to £166 10s. each—an average of a fraction over £165 11s. 5d. The total amount realized was £82,786 10s. On the same day, Mr. Frank Lloyd sold some £5 shares in the Whitchurch and Dodington Gas Company, earning 6 per cent. dividend, at £7 10s., £7 12s. 6d., and £7 15s. each. On the following evening, Mr. W. E. R. Randall disposed of 900 ordinary £5 shares in the Brompton, Chatham, and Rochester Water Company at £10 each. The shares were a portion of the capital authorized by the Company's Act of last year for the further extension of their works at Luton. Messrs. Nicholson and Company, of Sheffield, lately sold £61 10s. of "C" stock of the Sheffield Gas Company at the rate of £248 per £100, and 24 "F" shares at £6 12s. 6d. each.

Projected Gas Exhibition at the Royal Aquarium.—Particulars are to hand of what is styled the "First Annual Great Gas and Allied Trades Exhibition," which it is proposed to hold at the Royal Aquarium, Westminster, from Dec. 21 this year to Jan. 23, 1900—a time of year chosen, after consultation with likely exhibitors, as one most convenient to the profession generally. It is hoped that the exhibition will embrace every trade involved in the production of coal gas, from the time the coal leaves the colliery to its consumption in burners, stoves, and engines. The central position of the Aquarium and the large floor-space available—an area which can easily be augmented, if necessary, by including the adjacent St. Stephen's Hall—lend themselves to an effective display of plant of interest not only to the gas profession at large, but to the general public, who are more concerned with the consumption of gas than with its manufacture. The organizers of the exhibition are Mr. M. J. G. Ritchie, son of Mr. Josiah Ritchie, the President and Managing Director of the Royal Aquarium and Winter Gardens Society, and Mr. T. G. S. Hersey; and the response already received to their preliminary enquiries as to firms likely to exhibit, leads them to anticipate an undoubted success for this their first venture in gas exhibitions.

The Supply of Gas in Stockton Out-Districts.—At the last monthly meeting of the Thornaby Corporation, Mr. Nevison, sen., drew attention to their position in reference to the gas supplied by the neighbouring Corporation of Stockton. He said the existing arrangement was not altogether satisfactory as far as they were concerned; and the feeling had been increased by the recent action of the Stockton Corporation in increasing the price of gas by 3d. per 1000 cubic feet. To be on a line with other towns, Stockton had reduced its rates by 4d. in the pound; and now they were going to get 3d. of it back by the increased price of gas. As a consequence of this move, Thornaby found themselves in the position of contributing to the rates of Stockton to the extent of 3d. in the pound. Last year Thornaby paid £460 for gas for lighting the public lamps and offices; and on account of the increased charge this year, it would be over £500. This, of course, would disturb their estimates; and he claimed that they ought to have had from the Stockton Corporation some notice of their intention months before. At present Thornaby already paid an extra 2d. above the price existing at Stockton, which he considered quite an unnecessary charge considering the large profit the gas-works were making. He moved that the whole question should receive the careful attention of the Council at the earliest possible date, with a view to some improvement being made in regard to it. Alderman Anderson said he was sure everyone in Thornaby was anxious that, if the gas could be got any cheaper from Stockton, they should have it. It was only right, however in fairness to the Stockton Corporation, to state that they were also raising the price to their own inhabitants. He knew also that the Gas Committee had now arrived at a point when they would have to spend a large amount of money upon increasing the facilities for supplying Thornaby with gas; and therefore it would be as well if the question now raised was thoroughly sifted before the Stockton Corporation were put to the expense which they would certainly have to undertake at once if they were going to continue the supply of gas to the town. He would therefore for this reason support the motion. The motion was adopted.

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Divination for Water.—The predictions of a water finder have resulted in a supply of water equal to 240 gallons per hour rising to the surface of the ground at Kippen, in Stirlingshire; and it is stated that there is every prospect of a larger quantity being ultimately obtained without the necessity for pumping.

Wolverhampton Corporation Water Supply.—At last week's meeting of the Wolverhampton Town Council, Alderman Marston proposed the adoption of the annual report of the Water Committee, which showed that the profit on the past year's working was £6632 or about £2000 more than the previous year. It was proposed that £4030 should be set apart to the credit of the improvement fund. The motion having been seconded, Alderman Williams protested against the allocation of the profit in the way suggested, as he did not see why he should pay a high price for water in order that the rates of other people might be reduced. He contended that the users of the water ought to benefit by any profit derived from the water-works. The report was, however, adopted.

Kingsbridge Water Supply.—On further consideration of the question of the water supply of the town, the Kingsbridge District Council have come to the conclusion that it is impossible to serve the town with a gravitation supply. It is now proposed to purchase the Washbrook and Garden Mills, and pump water from the river. The idea is that there will be sufficient water to afford the necessary power for eight months in the year, and for the remaining four months an engine is to be used. A reservoir will be built on the site selected in connection with the abortive gravitation scheme. The water now proposed to be used is described as "fairly pure;" but is to be filtered as an additional precaution. Messrs. J. Taylor, Son, and Santo Crimp have been appointed Engineers for the scheme.

The Risks of Well-Sinkers.—Last Tuesday, an inquiry was held respecting the death of Henry Pearson, 36, a well-sinker, which took place on the previous day at the Southport Water-Works, Aughton. The deceased had been engaged with another well-sinker named Cook in renewing the pipings of the pumps in the well; and they had reached to within two pipes of the top. Previously they had worked without scaffolding; but on this occasion they put in a special scaffold, consisting of loose planks placed upon permanent bearers in the well. About half-past eleven the two men were hoisting one of the old pipes—both in turn steadying the rope. Pearson, who stood a little along the scaffolding on a pair of iron clamps, slipped. He touched the edge of a plank of the scaffolding in his fall, and carried it down with him, a distance of about 160 feet. He was quite dead when recovered. Both Cook and Parkin, the foreman, said the scaffolding was of the kind used in such cases, and was as safe as it could be made. Mr. R. Knowles (the Foreman of the Jury) said that if the planks were in a similar position at the time of the accident to that he saw at the works that day, some of them were merely traps. They projected over the bearers, and a man stepping on one of the edges would surely go through. The Jury returned a verdict of "Accidental death," adding the recommendation that in future jobs of this kind the scaffolding should be bolted, nailed, or lashed together.

Boston (Lincs.) Gas Company.—The annual meeting of this Company was held on Thursday—Mr. S. Sherwin presiding. The Directors' report showed that the net profits for the past year amounted to £2788. The balance standing to the credit of the profit and loss account, after paying the interim dividend in February, amounted to £4135, out of which the Directors recommended the payment of the remainder of the full dividend (8½ per cent. on the old, and 7 per cent. on the new shares) on both classes of shares; leaving a balance of £2760 to be carried forward. The Chairman having moved the adoption of the report, it was adopted, and the dividend recommended declared.

Additional Pumping Plant for the Slough Water Company.—At the last meeting of the Directors of this Company, it was decided to augment the present pumping power, and, with the view of meeting the growing demand for water, to put down a direct-acting pumping-engine. The order has now been placed with the Hydraulic Engineering Company, of Chester, for a compound surface condensing duplex Blake pump, capable of lifting a million gallons of water per day. Before deciding upon the type of duplex pump to adopt, the Company made inquiries and visited numerous pumping-stations, among others that of the Grantham Water-Works, where an engine of similar design and manufacture has been at constant work for the last six months, giving, we are informed, very satisfactory and economical results. The speciality of the Blake pump is the uniform full length of stroke combined with a slow piston speed.

The Winding up of the Kettering Water Company.—A meeting of the shareholders of the Kettering Water-Works Company was held on Monday last week, for the purpose of considering the scheme of distribution. The chair was occupied by Mr. J. T. Stockburn, who first reviewed the history of the Company, and then submitted the scheme of distribution, which was read by the Secretary and Manager (Mr. T. A. Simpson), as follows: The transfer of the undertaking to the Kettering Urban District Council was completed on the 23rd ult., and payment of the awarded sum of £127,880 duly made to the Directors. In accordance with the provisions of section 12 of the Kettering Water Act, 1898, and having very carefully considered the question, we have unanimously decided to recommend the following scheme, and to submit the same to the shareholders for their adoption: To distribute the purchase-money and other assets (if any) between the "A" capital (£10,000) and the "B" capital (£44,880) in the proportion of 10 per cent. on the "A" and 7 per cent. on the "B." The total distribution under this scheme of the awarded amount of £127,880 (assuming that the whole were available) is equal to a sum of about £30 17s. 6d. per share on the 1000 "A" shares, £30,876 19s.; and about £21 12s. 3d. per share on the 4488 "B" shares, £97,003 1s.—making together a total of £127,880. We have, however, decided to distribute in the first instance £120,106 8s. only; leaving the balance of £7773 12s. as a margin for possible contingencies. This will mean the shareholders immediately receiving £29 per share on the "A" shares, £29,000; and £20 6s. per share on the "B" shares, £91,106 8s.—making a total of £120,106 8s. The report was adopted; and it was decided that each Director should receive £100.

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MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
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BRANTFORD (Remodelled)	200,000
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AND ADDITIONAL WORK.

Among recent gas exhibitions, the following may be noted: By Messrs. Fletcher, Russell, and Co., Limited, at Ingleton, with lectures by Mrs. H. M. Young; and by Messrs. John Wright and Co., in the Town Hall, Gateshead, with cookery demonstrations by Miss M. B. Terrace.

Messrs. Falk, Stadelmann, and Co., Limited, have just issued a special price list (No. 81) of Jena patent chimneys with lateral air supply, for street lighting and domestic use. These chimneys are specially constructed to suit the old type of Welsbach burner; and it is claimed for them that they produce a very large increase of light.

A contract for coal breaking, elevating, and conveying machinery, to the designs of Mr. W. R. Chester, and in connection with the installation of inclined retorts now in construction at the Eastcroft works of the Nottingham Corporation, has recently been placed in the hands of West's Gas Improvement Company, Limited.

As will be seen by an announcement which appears elsewhere, the Southwark and Vauxhall Water Company are about to make a further issue of their 3 per cent. debenture stock, redeemable at par 25 years from the date of issue. The Company is the third largest of the Metropolitan Water Companies; and, owing to the development of the area supplied, their gross revenue has risen in ten years from £210,643 to £273,585. The stock is a lawful investment for trustees.

An announcement which appears elsewhere sets forth that Messrs. Edwin Fox and Bousfield have received instructions from the Directors of the Northfleet and Greenhithe Gas Company, Limited, to offer for sale at the Mart, Tokenhouse Yard, E.C., on the 26th inst., 500 ordinary "C" shares in the Company. They rank for a standard dividend of 7 per cent.; and for the last six years 8½ per cent. has been paid upon them, though at the present price of gas they would carry 10½ per cent.

West's Gas Improvement Company, Limited, gave their employees the usual annual excursion on Saturday, the 8th inst.; the place selected being Blackpool. About 300 participated in the event, and all spent a most enjoyable day. The officials and staff were entertained to dinner at the County and Lane Ends Hotel. Mr. John West was in the chair, and made a few remarks suitable to the occasion; commenting chiefly on the rapid growth of the staff during the last few years owing to greatly increased business.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

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[For Illustrated Advertisement, see July 4, p. 74.]

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One EXHAUSTER, 20,000 Cubic Feet per hour.
Two " 5000 " " "
Also CONDENSERS, SCRUBBERS, WASHERS GASHOLDERS and TANKS, VALVES, &c., &c.

Apply to SAML. WHILE AND SON, 60, Queen Victoria Street, LONDON, E.C.

FOR SALE, cheap to clear—

TOWER SCRUBBER, Walker's, 5 ft. by 40 ft.
STATION METER, 8-inch, complete and perfect.
EXHAUSTER and ENGINE, combined, Waller's, 9-inch Valves, Governors, &c., complete.
GASHOLDER, 35 ft. by 14 ft. deep. Only six years old.

If sold this month will accept any reasonable offer.

J. FIRTH BLAKELEY & Co., Thornhill, DEWSBURY.

TAR.

THE Directors of the Ormskirk Gaslight Company are prepared to receive TENDERS for their surplus TAR for Two Years, from Sept. 1, 1899, to Sept. 1, 1901, free on Rails at the Ormskirk Railway Station at a price per ton of 2240 lbs.

Tenders to be addressed to the Chairman of the Gas Company, Gas Company's Offices, Aughton Street, Ormskirk, and to be sent in on or before Saturday, July 22, 1899.

JOHN MARTIN.

Ormskirk, July 8, 1899.

THE GASLIGHT AND COKE COMPANY.

TENDERS FOR COKE.

THE Directors of this Company are pre- pared to receive TENDERS for the purchase of COKE to be supplied into Barges or Railway Trucks at their Beckton, Nine Elms, and Fulham Stations within the Twelve Months ending the 30th of September, 1900.

Particulars and Forms of Tender can be obtained upon application at this Office.

Tenders to sent in at or before Noon on Wednesday, the 26th inst., addressed to me, and endorsed "Tender for Coke."

The Directors do not bind themselves to accept the highest or any Tender.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., July 7, 1899.

WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

TO GASHOLDER MAKERS.

THE Directors of the above Company are prepared to receive TENDERS for the supply and erection of a THREE-LIFT TELESCOPIC STEEL GASHOLDER, 145 feet in diameter.

Copies of Specification and Prints of Drawings may be obtained on application to the undersigned on payment of £2 2s., which amount will be returned on receipt of a *bonâ-fide* Tender, and the return of the Specification and Drawings in the event of non-acceptance of the same.

Sealed Tenders, addressed to the Chairman of the Company, and endorsed on cover "Tender for Gasholder," to be delivered at this Office by Noon on Monday, Aug. 14, 1899.

The Directors do not bind themselves to accept the lowest or any Tender.

By order,
H. H. JONES,
Engineer and Manager.

Gas-Works, North Street,
Wandsworth, S.W.,
July 13, 1899.

NEWBRIDGE, MULLINGAR, ROSCREA, AND OTHER GAS-WORKS.

TENDERS are invited for the supply of 2500 Tons of best screened GAS COAL, to be delivered into Railway Trucks, North Wall, Dublin—One half in August, the remainder in January. Also for about 300 Tons to be delivered into Railway Trucks, Cork, during August or September.

Tenders to be delivered to C. S. SPEAR, 200, Great Brunswick Street, DUBLIN, on or before July 28, 1899.

HINCKLEY URBAN DISTRICT COUNCIL.

(GAS DEPARTMENT.)

TENDERS FOR COKE.

TENDERS are invited for the purchase of 1000 to 1500 Tons of COKE, delivered into Railway Trucks at Hinckley Station during the Twelve Months ending July 31, 1900.

Further Information may be obtained from Mr. Lee, Gas-Works, Hinckley, to whom Tenders, endorsed "Tenders for Coke," must be sent on or before Monday, the 24th inst.

RAMSBOTTOM GAS COMPANY.

THE Directors of the above Company are open to receive TENDERS for the purchase of their surplus TAR and AMMONIACIAL LIQUOR, free on Rail in Purchaser's Tanks, for One Year ending June 30, 1900.

Forms of Tender may be obtained on application to the undersigned.

Sealed Tenders to be sent to the Chairman on or before Aug. 1, and endorsed "Tar and Liquor."

F. BARRETT,
Manager and Secretary.

Gas-Works, Ramsbottom.

OSWALDTWISTLE URBAN DISTRICT COUNCIL.

THE Gas Committee invite Tenders for the TAR and LIQU R produced at their Works for One Year from the 31st day of July, 1899.

The quantity of Coal carbonized is about 3700 Tons.

Further Particulars may be obtained from the Manager, Gas-Works, Church, near Accrington.

Tenders, endorsed "Tender for Tar," to be addressed to me, and to be delivered not later than Wednesday, the 2nd of August.

WM. SANDEMAN,
Clerk.

District Council Offices,
Oswaldtwistle,
July 14, 1899.

TO COAL CONTRACTORS AND OTHERS.

EXTENSION OF TIME.

THE Sedgley Urban District Council invite TENDERS for supplying 500 to 1000 Tons of GAS COAL, the deliveries to be made at the Shut End Siding at such times and in such quantities as may be directed.

Sealed Tenders, marked "Coal," must be sent to me on or before the 2nd of August next.

The Council do not bind themselves to accept the lowest or any Tender.

By order,
JOSEPH SMITH,
Clerk to the Council.

Offices: High Holborn, Sedgley,
July 15, 1899.

BOROUGH OF DARWEN.

(GAS DEPARTMENT.)

SPENT OXIDE.

THE Corporation are prepared to receive TENDERS for the purchase of about 520 Tons of SPENT OXIDE.

All Particulars may be obtained on application to Mr. A. H. Smith, Gas Engineer, Darwen.

Sealed Tenders, endorsed "Spent Oxide," to be delivered to the undersigned at or before noon July 27, 1899.

The highest or any Tender not necessarily accepted.

By order,
CHAS. COSTEKER,
Town Clerk.

Town Clerk's Office, Darwen,
July 10, 1899.

CITY OF BELFAST.

CONTRACT FOR COAL.

THE Gas Committee of the Belfast Cor- poration invite TENDERS for a supply of 110,000 Tons of best Screened GAS COAL, to be delivered free and trimmed in Barges at Belfast Harbour between Sept. 1, 1899, and Aug. 31, 1900

No Tender for less than 10,000 Tons will be considered.

Monthly Quantities and Particulars may be obtained from the Manager of the Gas-Works.

Tenders, on Office Forms, endorsed "Tender for Coal," must be delivered at my Office not later than July 27, 1899.

The lowest or any Tender not necessarily accepted.

SAMUEL BLACK,
Town Clerk.

COUNTY BOROUGH OF SALFORD.

THE Gas Committee invite Tenders for the supply and erection of a ROTARY WASHER-SCRUBBER at their Liverpool Street Works.

Copies of the Specification and Form of Tender may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.

Sealed Tenders, endorsed "Tenders for Washer," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m., on Thursday, the 27th of July, 1899.

L. C. EVANS,
Town Clerk (*pro tem.*).

Town Hall, Salford,
June 15, 1899.

CITY OF BRADFORD.

TAR.

THE Gas and Electricity Supply Com- mittee of the Bradford Corporation are prepared to receive TENDERS for the purchase of their surplus TAR for the Year commencing Sept. 1, 1899.

Form of Tender with any further Information required may be had on application to Mr. C. Wood, Gas Engineer, Town Hall.

Sealed Tenders, endorsed "Tender for Tar," to be sent to me on or before Wednesday, the 2nd of August next.

Persons tendering must give an assurance that they have paid to their Workmen for the Three Months preceding date of Tender not less than the minimum Standard Rate of Wages, and undertake to continue to pay during the contract the same Rate of Wages.

The highest or any Tender will not necessarily be accepted.

FREDERICK STEVENS,
Acting Town Clerk.

Town Hall, Bradford,
July 14, 1899.

CRYSTAL PALACE DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Albion Tavern, Aldersgate Street London, E.C., on Friday, the 4th day of August, 1899, at Three o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June last, to declare a Dividend for the same period, and for General Purposes.

The TRANSFER BOOKS WILL BE CLOSED from the 20th day of July, until after the Meeting.

By order of the Board,
CHARLES M. OHREN,
Secretary.

Offices and Works:
Lower Sydenham, S.E.,
July 17, 1899.

SOUTH METROPOLITAN GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Cannon Street Hotel, in the City of London, on Wednesday, the 9th day of August next, at Two o'clock in the afternoon precisely, to receive the Directors' Report and the Accounts of the Company for the Half Year ended the 30th of June last, to declare a Dividend for the same period, and to consider a recommendation of the Directors to increase the remuneration of the Secretary.

The TRANSFER BOOKS WILL BE CLOSED from the 26th day of July until after the Meeting.

By order,
FRANK BUSH,
Secretary.

Offices: 709A, Old Kent Road, S.E.,
July 15, 1899.

SOUTHWARK AND VAUXHALL WATER COMPANY.

SALE BY TENDER OF £150,000 THREE PER CENT. DEBENTURE STOCK.

NOTICE is Hereby Given, that it is the intention of the Directors of the Southwark and Vauxhall Water Company to SELL BY TENDER to be received at the Company's Office, Southwark Bridge Road, S.E., not later than Twelve o'clock (noon) on Tuesday, July 25, 1899, £150,000 DEBENTURE STOCK of the Company.

The Stock now for Sale is the fourth portion of the Capital authorized by, and to be issued under, the provisions of the Southwark and Vauxhall Water Act, 1894, and will be entitled, from Sept. 30, 1899, to Interest at the rate of £3 per cent. per annum. It will be known as Debenture Stock "B;" and may be redeemed at par at any time after the expiration of 25 Years from date of issue, subject to Six Months' previous notice of the intention to redeem. Debenture Stock "B" will rank for Interest and otherwise *pari passu* with the other Debenture Stock of the Company, but before the Ordinary and Preference Stock and Share Capital. It is a lawful investment for Trustees.

For Particulars, Forms, and Conditions of Tender, apply at the Office of the Company, Southwark Bridge Road, S.E.

By order of the Board of Directors,
MONTAGUE WATTS,
Secretary.

Southwark Bridge Road, S.E.,
July 14, 1899.

By EDWIN FOX AND BOUSFIELD.

AT THE AUCTION MART,

ON WEDNESDAY, JULY 26, AT TWO O'CLOCK.

BY ORDER OF THE DIRECTORS.

NORTHFLEET and GREENHITHE Gas Company, Limited.—Issue of £2500 New CAPITAL in 500 £5 "C" SHARES, ranking for a Standard Dividend of 7 per cent., which, subject to the Sliding-Scale, has increased to 8½ per cent. per annum at present. The Company was established in 1881, and the total Authorized Capital is £30,000; this issue forming part. Its operations have been very successful; the Dividend paid on the "A" Stock at the present time is 11½ per cent. This Issue affords a very sound, secure, and improving Investment. It will be offered in 25 lots of 20 Shares.

Particulars at Messrs. EDWIN FOX AND BOUSFIELD'S OFFICES, 99, Gresham Street, BANK, E.C.; of Mr. W. R. BURRELL, Secretary to the Company, NORTHFLEET, and of the Solicitor to the Company, Mr. MARK LEADER, 60, St. PAUL'S CHURCHYARD, E.C.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held MONTHLY, at the Mart, Tokenhouse Yard, E.C.

He also undertakes the issuing by Auction of Gas and Water Stocks and Shares under Parliamentary Powers.

Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. Alfred Richards's Offices, 18, FINSBURY CIRCUS, E.C.

NITRATE of Thorium and Cerium. FABRIK CHEMISCHER PRAEPARATE VON STHAMER, NOACK, AND CO., HAMBURG.

ENRICH YOUR GAS WITH CHEAP

BENZOL,

SPECIALLY PREPARED, FREE FROM SULPHUR.

AT to-day's Price of Benzol, Illuminating POWER costs less than ONE-THIRD OF A PENNY PER CANDLE.

Apply to SADLER & CO., MIDDLESBROUGH.

THE SILICA FIRE-BRICK COMPANY,

OUGHTIBRIDGE, near SHEFFIELD,

MANUFACTURE

SILICA BLOCKS, BRICKS, AND CEMENT

OF SUPERIOR QUALITY

FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their

GREATER DURABILITY,

Strongly recommended where EXCESSIVE HEATS have to be maintained.

BOLDON GAS COALS.

ANALYSIS.

Yield of Gas per Ton.	10,500	Cubic Feet.
Illuminating Power	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

For Prices, &c., apply to

W. H. PARKINSON,

THE HARTON COAL CO., LTD.,

NEWCASTLE-ON-TYNE.

Telegraphic Address: "PARKINSON, NEWCASTLE."

LONDONDERRY GAS COALS

FROM THE

MARQUIS OF LONDONDERRY'S COLLIERIES,

COUNTY OF DURHAM.

Available Output up to 5000 Tons per day.
Yield of Gas 11,000 cubic feet per Ton of Coal as per Analysis by
Mr. John Pattinson, F.C.S., F.I.S.

FOR PRICES AND PARTICULARS, APPLY TO

S. J. DITCHFIELD,

SEAHAM HARBOUR, COUNTY OF DURHAM.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES,
SPANNERS, RATCHET BRACES, LIFTING JACKS,
ANVILS, VICES,
AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE:

90, CANNON STREET, E.C.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL CO., LD.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON.

Yield of Gas per Ton	10,500	Cub. Ft.
Illuminating Power	16·9	Candles.
Coke (of good quality)	67·5	per Cent.
Sulphur	0·58	,,
Ash	2·73	,,

For Price, &c., apply to the

WEARDALE IRON & COAL CO., LD.

QUAYSIDE, NEWCASTLE-ON-TYNE.

HOLMSIDE

GAS COALS.

Present Daily Produce over 5000 Tons.

Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton	11,205 Cubic Feet.
Illuminating Power	$16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality)	$13\frac{3}{4}$ Cwt. per Ton.
Sulphur	A little over 1 per Cent.
Ash	Under 1 per Cent.
Tar	163 lbs. (Avoir.) per Ton.
Ammoniacal Liquor	103 lbs. (Avoir.) per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR

PELTON GAS COALS.

Present Daily Produce available 3000 Tons.

Of equal quality to the "Holmside" Coal, and also very largely used by many Gas Companies at Home and Abroad.

Both descriptions are shipped at Tyne Docks, and Dunston Staiths, River Tyne, also at North and South Docks, Sunderland.

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE & SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

WORKMANSHIP and MATERIALS OF THE HIGHEST QUALITY.

PECKETT'S LOCOMOTIVES

Built to any Specification or Gauge.

PECKETT & SONS, Atlas Locomotive Works, BRISTOL.

THE WIGAN COAL & IRON CO., LIMTD.,

Are exclusive Owners of the well-known HAIGH HALL & KIRKLESS HALL GAS COAL COLLIERIES, and supply the Best Wigan Arley Mine Gas Coal, Gas Nuts, Gas Cannel, Cannel Nuts, &c.

Midland and West of England District Office: 6, CORPORATION STREET, BIRMINGHAM—Sole Agent: A. C. SCRIVENER.

Telegraphic Address: "WIGAN, BIRMINGHAM." Telephone No. 200]

London District Office: 6, STRAND, LONDON—C. PARKER & SON, Sole Agents.

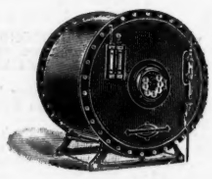
Telegraphic Address: "PARKER, LONDON."

JAMES MILNE & SON, LTD.,

GAS ENGINEERS

MILTON HOUSE WORKS EDINBURGH.

LONDON. —— LEEDS. —— GLASGOW.



G. & J. HAIGH,

Raven's Lodge Fire-Brick Works, DEWSBURY.

Manufacturers of MACHINE-MADE RETORTS and

FIRE-BRICKS of the highest Quality, made from Fire-Clay of a most Superior and Refractory Character suitable for **GLASS-WORKS, GAS-WORKS, and BLAST-FURNACES.**

For Prices and Analysis, apply as above.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN, CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 Feet of 19-Candle Gas per Ton.

Value in Pounds of Sperm, 820·80.

VERY FREE FROM IMPURITIES.

TELEGRAMS: "ATLAS, SHEFFIELD."

INCLINED RETORTS

UP-TO-DATE FURNACES AND SETTINGS.

J. & H. ROBUS, 20, Bucklersbury, London, E.C.

MOBBERLEY & PERRY

STOURBRIDGE.

Manufacture & supply best quality of

Gas Retorts (SEGMENTAL, HORIZONTAL, or INCLINED.)

Special Bricks & Blocks for GENERATOR & REGENERATOR FURNACES.

FIRE BRICKS, LUMPS, & TILES, BLUE STAFFORDSHIRE VITRIFIED BRICKS FOR PAVING, &c. &c.

EVERY REQUISITE FOR GAS-WORKS. Retort Setters sent to any part of the Kingdom.

London Agents: Contractors for the erection of Retort-Benches complete.

BALE & HARDY, Gas Engineers and Contractors, BRIDGE HOUSE, 181, QUEEN VICTORIA STREET, E.C.

THE SUNLIGHT INCANDESCENT GAS-BURNER

Applications for **AGENCIES** now being received.

NOTE THESE FEATURES:

A1. WHITE MANTLES.
Longest Lived and Highest Candle Power.

'SUNLIGHT' TINTED MANTLES.
Strongest and Pleasantest Colour.

These are INTERCHANGEABLE on same Burner.

BURNERS WITH CHIMNEYS.
Cheapest in the Market.

CHIMNEYLESS BURNERS.
Cheapest, Simplest, and Most Efficient.

SELF-LIGHTER.
Only Efficient System.

A great sensation with this unique combination of features is promised to our Agents for the coming season. Any firm of standing, applying early enough, will be very favourably dealt with.

An early visit to the London Show-Rooms is especially solicited.

SPECIAL NOTICE.

Sunlight Tinted Mantles have been declared by the Courts to be "as far asunder as the Poles" from the Welsbach System, and we guarantee that our

SUNLIGHT WHITE MANTLES

are NO Infringement of that or any other Patent, and are made under a Series of Independent Patents, and by an entirely New Process.

We give with every Mantle sold an absolute indemnity to both seller and user against all molestation on this account.

Price Lists, &c., on application.

New Sunlight Incandescent Co., Ltd.,

33 & 34, SHOE LANE, LONDON, E.C.

Telegrams: "IGNIFLUOUS." A.B.C. and A1. Codes used. Telephone: No. 947 Holborn.

THE "DE BROUWER"
PATENT COKE-CONVEYOR

FOR ELEVATING AND CONVEYING.

SUPERSEDES ALL OTHERS FOR DEALING AUTOMATICALLY WITH

— HOT COKE. —

DOES NOT BREAK THE COKE. SIMPLE AND EFFECTIVE.

25 INSTALLATIONS now at Work.

SUITABLE FOR SMALL AS WELL AS LARGE RETORT-HOUSES.

GUARANTEED BY SOLE MAKERS:

W. J. JENKINS & CO., Ltd., RETFORD.

R. LAIDLAW & SON,

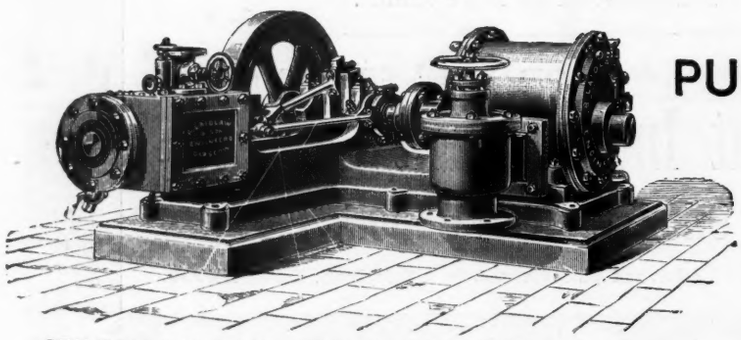
ENGINEERS & IRONFOUNDERS,

CAST-IRON PIPES

ALL SIZES.

MANUFACTURERS OF

STEAM-ENGINES,
EXHAUSTERS,
VALVES,
AND
PUMPING-ENGINES.



BEALE'S GAS EXHAUSTER AND ENGINE COMBINED. ALL SIZES.

ALL KINDS OF

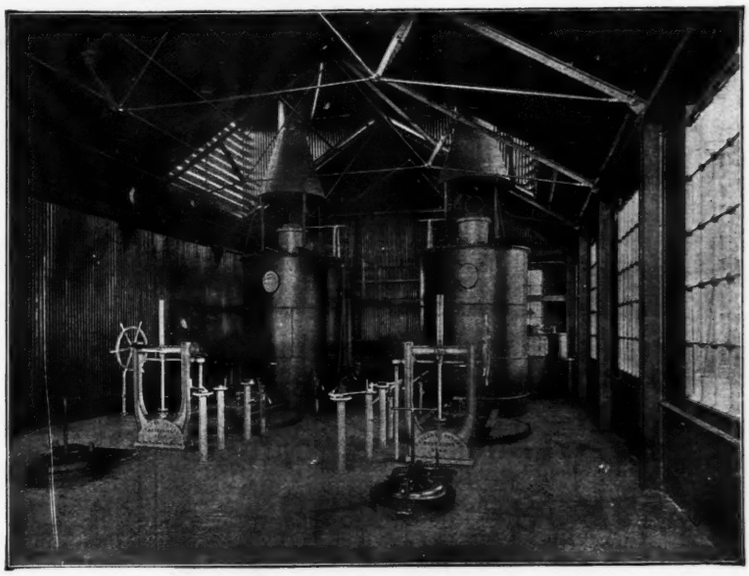
GAS AND WATER APPARATUS.

ALLIANCE FOUNDRY, GLASGOW. | SIMON SQUARE WORKS, EDINBURGH. | 6, LITTLE BUSH LANE, LONDON, E.C.

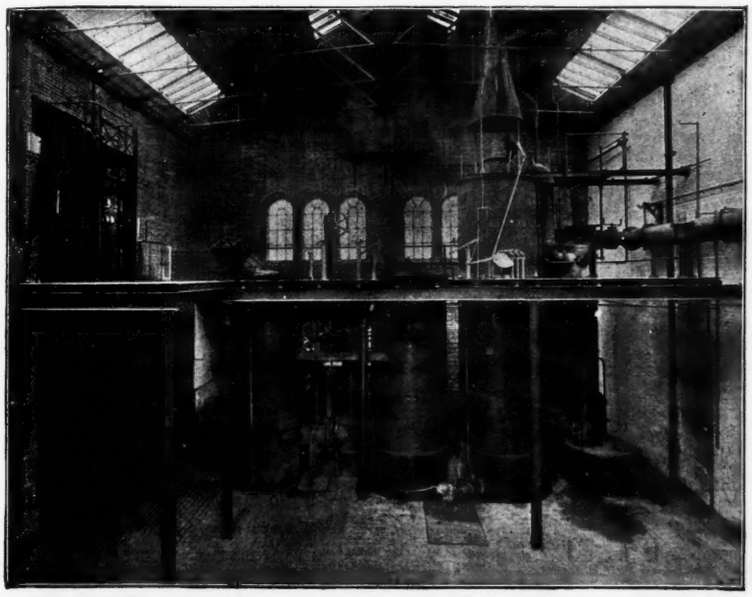
S. Cutler & Sons,
Millwall, London.

GASHOLDERS.

CARBURETTED WATER-GAS PLANT.



Water-Gas Plant at Southall.



Water-Gas Plant at Folkestone.

Carburetted Water-Gas Installations.

HORNSEY.
HASTINGS.
BUENOS AYRES.
SOUTHEND.
PLYMOUTH.
SOUTHALL.
HARROW.
HORSHAM.
FOLKESTONE.
BEXHILL.

SOUTHEND (2nd Order).
PLYMOUTH (2nd Order).
SOUTHALL (2nd Order).
FOLKESTONE (2nd Order).

CUTLER'S PATENT GUIDE-FRAMING FOR GASHOLDERS

ADOPTED FOR

MANY IMPORTANT GASHOLDERS.

OIL-TANKS.

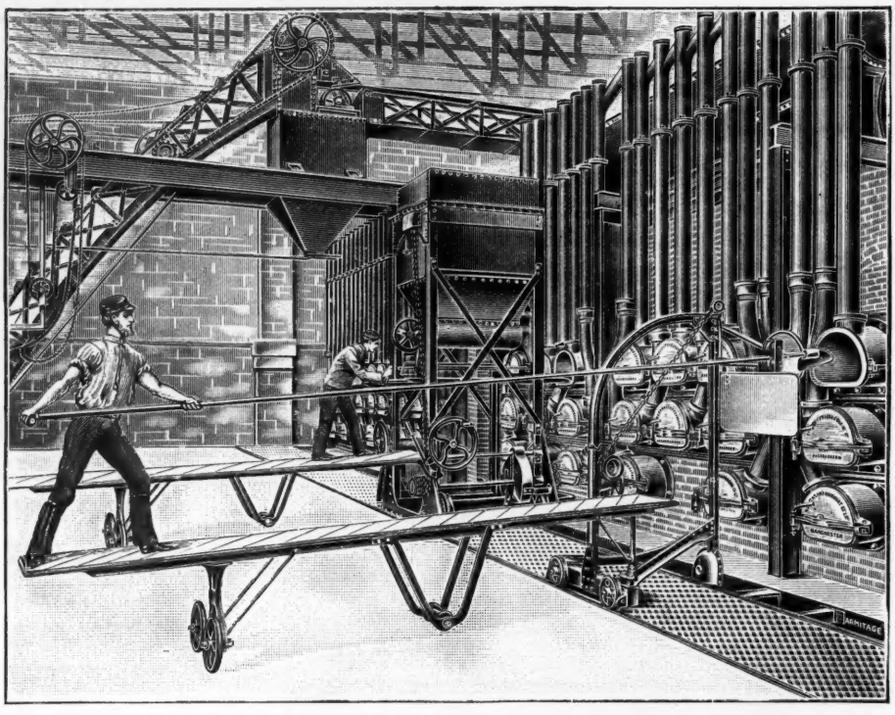
EVERY DESCRIPTION OF GAS-WORKS APPARATUS.

Water-Gas Plant at Southend.

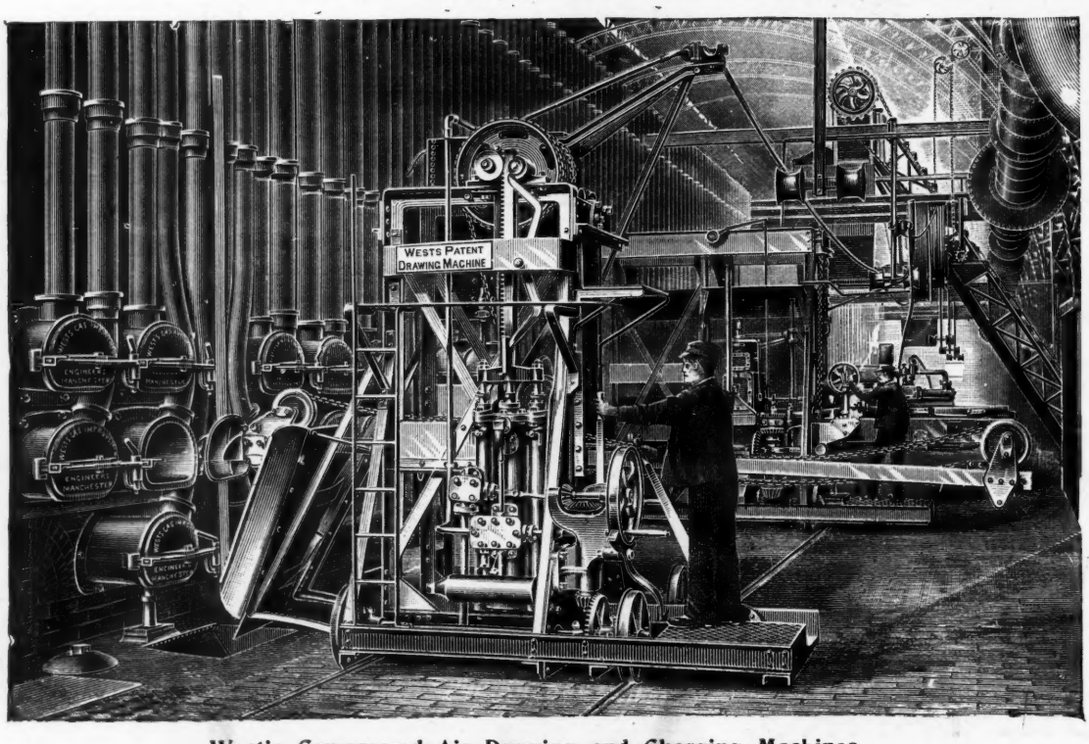
WEST'S GAS IMPROVEMENT CO., LTD.

ALBION IRON-WORKS, MILES PLATTING, MANCHESTER:

And 104, Queen Victoria Street, London, E.C.



West's Manual Charging and Drawing Machines.
NOTE: The Hoisting Gear on Charging Machine may be driven by Hand or Power.



West's Compressed-Air Drawing and Charging Machines.

Contractors for

West's Patent Regenerators, Retort-House Plant and Machinery.

1881 and 1899.

COLUMNS CABLES.

1881. We supplied a Local Board with a Single-Lift Gasholder and Columns.

1899. We have this year purchased these Columns from the Urban District Council. We are also substituting Cables, and adding a Lift to the Holder.

The cost of the Columns with Interest at 3½ per cent. for 18 years—

£1634.

1899. We are also supplying to the order of another Gas Company a Two-Lift Gasholder with new Columns from the same patterns. If these in turn are replaced by Cables in 18 years, the adoption of Columns for that period will have cost this Gas Company

£2330.

ASHMORE, BENSON, PEASE, & CO., LTD.,

STOCKTON-ON-TEES,

MANUFACTURERS OF

GASHOLDERS, PURIFIERS, SCRUBBERS, CONDENSERS, WASHERS, ROOFS, GIRDERS, SULPHATE PLANTS, VALVES, &c., &c.

London Office: 181, QUEEN VICTORIA STREET, E.C.

Telegrams: "Gasholder, Stockton-on-Tees." "Apparatus, London."

Paris Office: 3, SQ. DES BATIGNOLLES.

ESTABLISHED 1844. **ORIGINAL MAKERS.** ESTABLISHED 1844.

LONDON, 1851. NEW YORK, 1853. PARIS, 1855. LONDON, 1862. DUBLIN, 1865. PARIS, 1867.

THE SIX MEDALS AWARDED TO THOMAS GLOVER'S PATENT DRY GAS-METERS;

The latter being the Highest Award for Dry Gas-Meters at the Paris Exhibition, 1867. Since then we have not Exhibited FOR PRIZES.

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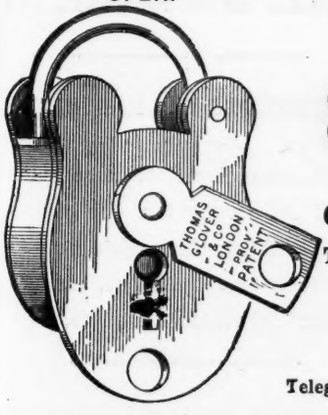

THOMAS GLOVER & CO.'S

PATENT

SECURE PADLOCK

PREVENTS TAMPERING WITH THE

CASH-BOXES OF PREPAYMENT METERS.

The Padlock is Sealed by means of a Lead Eyelet, which is impressed with Company's private mark. Eyelets easily fixed and removed by Company's Collector.

CLOSED.

Telegraphic Address: "GOTHIC, LONDON." Telephone No. 725, Holborn.

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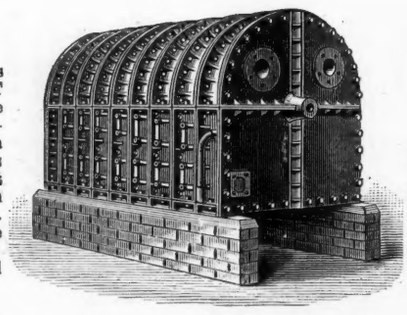

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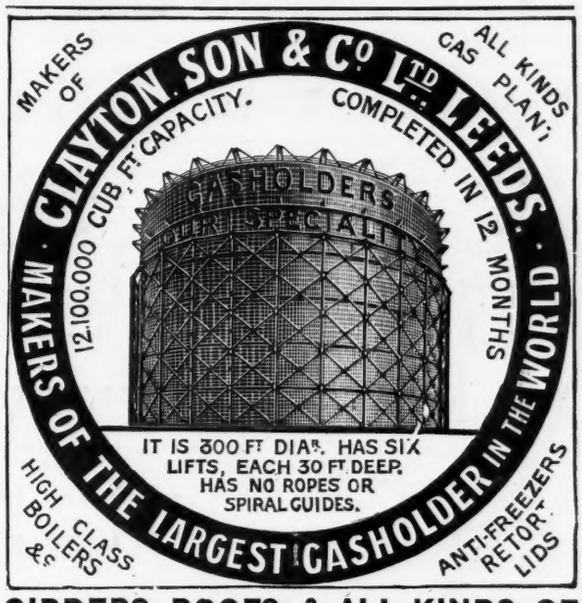
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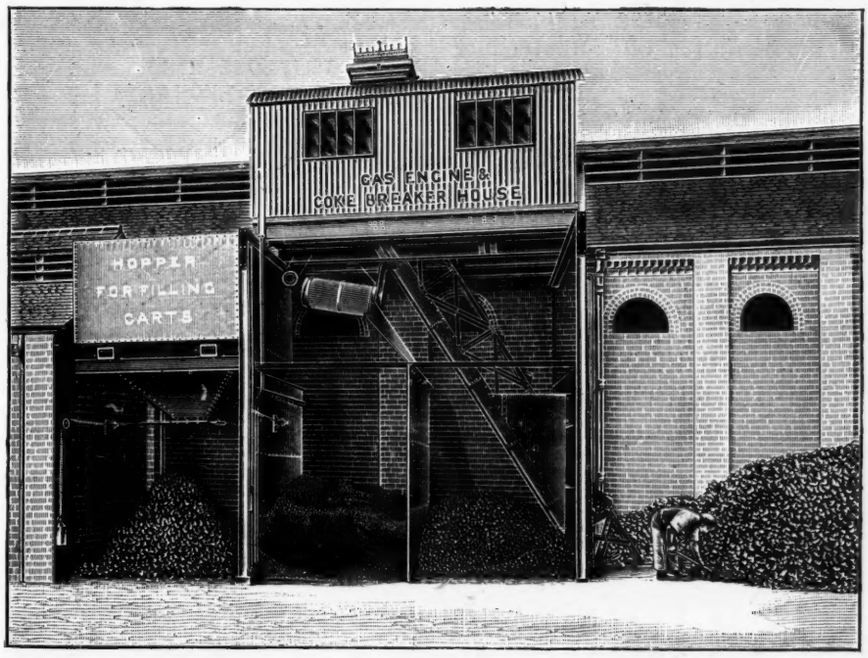

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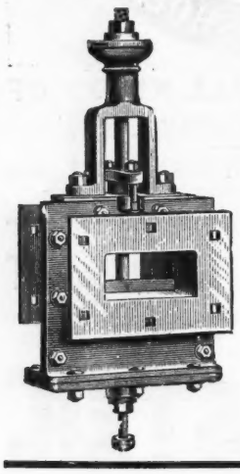

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